

THE UNIVERSITY OF HULL



**Implementation of Supply Chain Management Theory in Practice:  
an empirical investigation in Ireland**

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by

Edward Sweeney, B.A., B.A.I., M.Phil.

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## ABSTRACT

Since its introduction by management consultants in the early 1980s, the supply chain management (SCM) concept has risen to prominence in both academic and commercial circles. A substantial body of academic knowledge has been, and continues to be, developed in the broad SCM domain. There is significant evidence that the effective implementation of SCM can result in improvements in the performance of firms. However, there is also evidence of a divergence between theory and practice in terms of SCM understanding and adoption. The fundamental purpose of the research described in this thesis is to disentangle the rhetoric from the reality in relation to SCM adoption in practice with specific reference to the situation in Ireland.

Based on a comprehensive literature review the thesis posits a new definitional construct for SCM – the *Four Fundamentals* – and sets out four research questions. Answering these questions requires that a methodologically pluralist approach be adopted based on the author's multi-paradigmatic philosophical positionality. In line with this, the empirical work comprises three main phases: focussed interviews, focus groups and a questionnaire survey. All phases use the author's definitional construct as their basis.

The data collected during the various stages of the empirical research allowed this definitional construct to be further developed. In addition, the findings suggest that, while levels of SCM understanding are generally quite high, there is room for improvement in relation to how this understanding is implemented in practice. In this context, a number of critical success factors and/or barriers to implementation are identified, as are a number of practical measures that could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption. There are some limitations in the author's research and their identification allows some potentially fruitful future research avenues to be identified.

This research contributes to the extant scholarly knowledge in the field by providing a profile of the current level of adoption of SCM theory in practice in an Irish context, as well as by contributing to scholarly rationalisation and understanding of the process of realising SCM theory in a practical context.

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# TABLE OF CONTENTS

<b>ABSTRACT</b>	ii
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	vi
<b>LIST OF FIGURES</b>	xi
<b>LIST OF TABLES</b>	xvii
<b>CHAPTER 1 – INTRODUCTION</b>	1
1.1 Introduction	1
1.2 Background to Research	1
1.3 Context of Research	3
1.4 Research Problem and Overall Approach	4
1.5 Thesis Structure	6
1.6 Summary	7
<b>CHAPTER 2 - LITERATURE REVIEW: UNDERSTANDING SUPPLY CHAIN MANAGEMENT</b>	8
2.1 General Background to Literature Review	8
2.2 The Evolving Supply Chain Management Context	12
2.2.1 Introduction	12
2.2.2 Internationalisation	13
2.2.3 Vertical Disintegration	15
2.2.4 Strategic Leverage	17
2.2.5 Concluding Comments	20
2.3 Historical Evolution of SCM	20
2.3.1 Fragmentation to Integration Model	21
2.3.2 Lean/Functional to Agile/Customised Migratory Model	22
2.3.3 Lummus and Vokurka Historical Perspective	24
2.3.4 Key Lessons from SCM Historical Evolution	26
2.4 SCM Definitions	27
2.4.1 Defining SCM (Mentzer et al. 2001)	27
2.4.2 SCM: A Strategic Perspective (Bechtel and Jayaram, 1997)	28
2.4.3 CSCMP Definition	29
2.4.4 Key Lessons from SCM Definitions	30
2.5 Paradigm Shifts	30
2.5.1 Christopher’s Paradigm Shifts	30
2.5.2 Conventional Management and SCM (Storey et al., 2006)	31
2.5.3 Supply Chain “Mega-Trends” (Bowersox et al., 2000)	32
2.5.4 Key Lessons from Paradigm Shifts	32
2.6 Development of SCM Theory	33
2.6.1 Background	33
2.6.2 Theories of SCM and Logistics	34
2.6.3 SCM and the Value Chain	35
2.6.4 Relating SCM to Other Theories	37
2.6.5 Some Concluding Comments	37
2.7 Towards a Unified Definition of SCM: the <i>Four Fundamentals</i>	38

2.8 <i>Fundamental One: Setting SCM Objectives</i>	41
2.8.1 The Role of Objectives	41
2.8.2 Customer Service	42
2.8.3 Total Supply Chain Investment and Costs	44
2.8.4 The Service/Cost Conundrum	47
2.8.5 <i>Fundamental One: Summary and Some Concluding Points</i>	48
2.9 <i>Fundamental Two: SCM Philosophy</i>	49
2.9.1 Supply Chain Integration	50
2.9.2 Internal Chain Integration	51
2.9.3 External Chain Integration	54
2.9.4 Performance Measurement	56
2.9.5 <i>Fundamental Two: Summary and Some Concluding Points</i>	61
2.10 <i>Fundamental Three: Managing the Flows</i>	62
2.10.1 Supply Chain Flows	62
2.10.2 Managing Material Flows	63
2.10.3 Managing Money Flows	66
2.10.4 Managing Information Flows	67
2.10.5 <i>Fundamental Three: Summary and Some Concluding Points</i>	68
2.11 <i>Fundamental Four: Supply Chain Relationships</i>	69
2.11.1 Supply Chain Relationship Management	69
2.11.2 Types of Relationships	70
2.11.3 The Impact of Vertical Disintegration	70
2.11.4 Strategic Partnering	71
2.11.5 The People Dimension	72
2.11.6 <i>Fundamental Four: Summary and Some Concluding Points</i>	73
2.12 Unified Definition of SCM: Some Concluding Points	74
2.13 SCM: The Role of Logistics and Other Antecedents/Perspectives	76
2.13.1 Logistics and the <i>Four Fundamentals</i> of SCM	76
2.13.2 Other Antecedents and Perspectives	76
2.13.3 Summary and Some Concluding Points	78
2.14 Reflection on the <i>Four Fundamentals</i> : From a Unified Definition Towards a Unified Theory of SCM?	78
2.14.1 Background	78
2.14.2 Lummus and Vokurka Practical Guidelines	79
2.14.3 Burgess et al. Constructs of SCM	80
2.14.4 Storey et al. Idealised Schemas	82
2.14.5 Summary and Some Concluding Points	83
2.15 Research Questions	83
2.15.1 Introduction and Theoretical Context	83
2.15.2 Divergence of Theory and Practice	84
2.15.3 The Forrester Forecast – Rhetoric or Reality?	85
2.15.4 Development of Research Questions	88
2.16 Summary and Some Concluding Comments	89
 <b>CHAPTER 3 - RESEARCH METHODOLOGY</b>	 91
3.1 Introduction	91
3.2 Research Philosophy	92
3.2.1 Ontology and Epistemology	92
3.2.2 Paradigms	93
3.2.3 The Positivist Paradigm	95
3.2.4 The Interpretivist Paradigm	95
3.2.5 Positionality - The “Paradigm Wars”	96

3.2.6 Towards a Multi-Paradigmatic Position?	99
3.2.7 Paradigmatic Preferences and Positionality in this Research	101
3.3 Research Methodology	103
3.3.1 Research Approaches: Induction and Deduction	104
3.3.2 Quantitative versus Qualitative Research	104
3.3.3 Combining Qualitative and Quantitative Strategies	106
3.3.4 Case Studies	107
3.3.5 Action Research	108
3.3.6 Grounded Theory	109
3.3.7 Methodology in this Research: Methodological Pluralism	110
3.4 Research Methods and Techniques	112
3.4.1 Surveys	112
3.4.2 Focussed Interviews	113
3.4.3 Focus Groups	114
3.4.4 Ethnography and Participant Observation	116
3.4.5 Research Methods and Techniques Used in this Research	117
3.5 Overall Research Design	120
3.6 Phase I: Focussed Interviews	122
3.6.1 Background	122
3.6.2 Data Collection	123
3.7 Phase II: Focus Groups	125
3.7.1 Background	125
3.7.2 Group Composition	127
3.7.3 Group Size	130
3.7.4 Summary of Composition and Size of Focus Groups	131
3.7.5 Conducting the Focus Groups	133
3.7.6 Analysing the Focus Group Data	137
3.8 Phase III: Survey Questionnaire	139
3.8.1 Background	139
3.8.2 Initial Design and Planning	141
3.8.3 Questionnaire Design Process	153
3.8.4 Identification of Data Requirements	155
3.8.5 Determination of Survey Question Wording	156
3.8.6 Data Analysis Considerations	159
3.8.7 Draft Questionnaire Pre-testing	162
3.8.8 Final Design and Planning	163
3.9 Summary and Some Concluding Points	165
 <b>CHAPTER 4 - PHASE I: FOCUSED INTERVIEWS</b>	 167
4.1 Background and Introduction	167
4.2 Evolution and Definitions of SCM and Logistics	168
4.3 SCM and Logistics Definitions in Practice: analysis of focussed interview data	169
4.4 Discussion of Results	171
4.4.1 Supply Chain	171
4.4.2 Logistics	173
4.4.3 The Relationship Between the Supply Chain and Logistics	174
4.4.4 Other Issues Raised	175
4.4.5 Comparison with Lummus et al. (2001)	175
4.4.6 Interview Findings and the <i>Four Fundamentals</i> of SCM	176
4.4.7 Towards a Model of the Relationship Between SCM and Logistics	178
4.4.8 Limitations and Suggestions for Further Work	180



4.5 Concluding Comments	182
<b>CHAPTER 5 - PHASE II: FOCUS GROUPS</b>	184
5.1 Background	184
5.2 Focus Group Findings	185
5.2.1 Focus Group 1 (FG1)	186
5.2.2 Focus Group 2 (FG2)	190
5.2.3 Focus Group 3 (FG3)	194
5.3 Participant Feedback	199
5.4 Analysis and Discussion	199
5.4.1 Qualitative Criteria: Reflection and Evaluation	199
5.4.2 Using Focus Group Data to Answer RQ1	203
5.4.3 <i>Four Fundamentals</i> Construct Refinement	207
5.5 Concluding Comments	213
<b>CHAPTER 6 - PHASE III: QUESTIONNAIRE SURVEY</b>	215
6.1 Background	215
6.2 Data Collection	216
6.3 Data Presentation	219
6.3.1 Questionnaire Section 1: Background	219
6.3.2 Questionnaire Section 2: SCM Objectives ( <i>Fundamental One</i> )	221
6.3.3 Questionnaire Section 3: Supply Chain Integration ( <i>Fundamental Two</i> )	224
6.3.4 Questionnaire Section 4: Supply Chain Flow Management ( <i>Fundamental Three</i> )	226
6.3.5 Questionnaire Section 5: Supply Chain Relationships ( <i>Fundamental Four</i> )	227
6.3.6 Questionnaire Section 6: Supply Chain Improvement	228
6.3.7 Respondent Information	229
6.3.8 Reflection and Summary	231
6.4 Data Analysis	231
6.4.1 Questionnaire Section 1: Background	231
6.4.2 Questionnaire Section 2: SCM Objectives ( <i>Fundamental One</i> )	245
6.4.3 Questionnaire Section 3: Supply Chain Integration ( <i>Fundamental Two</i> )	256
6.4.4 Questionnaire Section 4: Supply Chain Flow Management ( <i>Fundamental Three</i> )	260
6.4.5 Questionnaire Section 5: Supply Chain Relationships ( <i>Fundamental Four</i> )	266
6.4.6 Questionnaire Section 6: Supply Chain Improvement	270
6.4.7 Relationships Across Sections	280
6.4.8 The Contingency Model	286
6.4.9 Questionnaire Data to Answer RQs	291
6.5 Summary/Conclusion	296
<b>CHAPTER 7 - DISCUSSION OF FINDINGS</b>	297
7.1 Introduction	297
7.2 Integrated Discussion of Empirical Findings	297
7.2.1 RQ1 - What is the current level of understanding of SCM in practice?	297
7.2.2 RQ2 - What is the current level of adoption of SCM?	300
7.2.3 RQ3 - What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?	303
7.2.4 RQ4 - What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?	309

7.3 Integrating Empirical Findings with the Literature	311
7.3.1 Empirical Findings and the <i>Four Fundamentals</i>	311
7.3.2 Empirical Findings and the Literature Review	315
7.4 Summary and Conclusion	319
 <b>CHAPTER 8 - GENERAL CONCLUSIONS, IMPLCATIONS AND SUGGESTIONS FOR FURTHER WORK</b>	 322
8.1 Introduction	322
8.2 Contribution of the Research	322
8.2.1 Knowledge Contribution	322
8.2.2 Methodological Contribution	325
8.3 Implications	329
8.3.1 Managerial Implications	329
8.3.2 Policy Implications	332
8.4 Research Limitations and Suggestions for Further Work	333
 <b>REFERENCES</b>	 336
 <b>APPENDICES</b>	 365
 APPENDIX 1: SELECTED SCM LITERATURE	
APPENDIX 2: SCOR MODEL	
APPENDIX 3: SCM DEFINITIONS	
APPENDIX 4: SUPPLY CHAIN SCHOOLS OF THOUGHT	
APPENDIX 5: THEORIES OF THE FIRM – TOWARDS A UNIFIED THEORY OF LOGISTICS	
APPENDIX 6: SUPPLY CHAIN 2000 FRAMEWORK – SIX COMPETENCIES	
APPENDIX 7: REVIEW OF PREVIOUS EMPIRICAL STUDIES	
APPENDIX 8: SUMMARY OF PAPER USING FOCUS GROUP METHOD IN LOGISTICS/SCM	
APPENDIX 9: FOCUS GROUP PARTICIPANTS AND COMPANY PROFILES	
APPENDIX 10: IDENTIFICATION OF QUESTIONNAIRE DATA REQUIREMENTS	
APPENDIX 11: FINAL QUESTIONNAIRE	
APPENDIX 12: QUESTIONNAIRE COVER LETTER	
APPENDIX 13: ANALYSIS OF RESPONDENT DEMOGRAPHIC DATA	

## LIST OF FIGURES

Figure 1.1: Structure of Thesis	6
Figure 2.1: Theoretical Framework for SCM Research	10
Figure 2.2: Structure of Chapter 2	11
Figure 2.3: The Strategic Alignment Model	19
Figure 2.4: SCM Evolution	21
Figure 2.5: Performance/Capability Continuum	27
Figure 2.6: Framework for Literature Classification	33
Figure 2.7: Porter's Value Chain	36
Figure 2.8: The <i>Four Fundamentals</i> of SCM	41
Figure 2.9: <i>Fundamental One</i> of SCM	41
Figure 2.10: Customer Service in Integrated SCM Performance Specification	44
Figure 2.11: Improved Financial Performance Measures the Effectiveness of SCM	47
Figure 2.12: Achieving Competitive Advantage through Integrated SCM	49
Figure 2.13: <i>Fundamental Two</i> of SCM	50
Figure 2.14: The Internal Supply Chain	52
Figure 2.15: Integrating the Internal Supply Chain	52
Figure 2.16: The External Supply Chain	54
Figure 2.17: Arcs of Integration	56
Figure 2.18: Phases of Development of Supply Chain Performance Measurement	58
Figure 2.19: Supply Chain Performance Metrics Framework	61
Figure 2.20: <i>Fundamental Three</i> of SCM	62
Figure 2.21: Perspectives on SCM versus Logistics	65
Figure 2.22: The Working Capital Cycle	66
Figure 2.23: <i>Fundamental Four</i> of SCM	69
Figure 2.24: Categories of Customer/Supplier Relationship	70
Figure 2.25: Components of SCM	72
Figure 2.26: Themes and Sub-themes in SCM Definitions	74
Figure 2.27: The Role of Marketing in SCM	77
Figure 2.28: A Hierarchy of Research Focus	78
Figure 2.29: Development of Research Questions	89
Figure 3.1: Structure of Chapter 3	91

Figure 3.2: Four Paradigms for the Analysis of Social Theory	94
Figure 3.3: Inductive and Deductive Research Approaches	104
Figure 3.4: Action Research “Spiral”	109
Figure 3.5: Overall Research Design	121
Figure 3.6: Detailed Focus Group Design Process	126
Figure 3.7: Factors Influencing Focus Group Effectiveness	129
Figure 3.8: The Effect of Group Size on Quality and Controllability	130
Figure 3.9: Focus Group Sectoral Breakdown	131
Figure 3.10: Company Overlap across Focus Groups	132
Figure 3.11: Nationality of Focus Group Participants	132
Figure 3.12: Gender of Focus Group Participants	132
Figure 3.13: Main Stages in Carrying Out a Questionnaire Survey and Structure of Section 3.8	140
Figure 3.14: Empirical Studies by Sector	143
Figure 3.15: Number of Firms in the Population by NACE Category	148
Figure 3.16: NACE Category G – Breakdown of Population by Level 2 NACE Divisions	149
Figure 3.17: NACE Category C – Breakdown of Population by Level 2 NACE Divisions	150
Figure 3.18: Design Process for Survey Questions	154
Figure 3.19: Questionnaire Refinement Process	163
Figure 4.1: Structure of Chapter 3	168
Figure 4.2: Transcript Analysis Process	171
Figure 4.3: The SCM and Logistics Domains	178
Figure 5.1: Structure of Chapter 5	185
Figure 5.2: Summary of Feedback from Focus Group 1	187
Figure 5.3: Summary of Feedback from Focus Group 2	190
Figure 5.4: Summary of Feedback from Focus Group 3	195
Figure 5.5: Testing for Data Saturation	201
Figure 5.6: New Words or Phrases in Focus Group Sessions	201
Figure 5.7: Overview of the <i>Four Fundamentals</i>	204
Figure 5.8: <i>Four Fundamentals</i> Refinement	208
Figure 6.1: Structure of Chapter 3	215
Figure 6.2: Survey Response Pattern	217
Figure 6.3: Responses by Sector	218

Figure 6.4: Relationship Between SCM and Logistics	220
Figure 6.5: Language and Terminology Used to Define SCM	220
Figure 6.6: Value of Single-Sentence Definitions of SCM	220
Figure 6.7: Formulation of Specific SCM Objectives	221
Figure 6.8: Focus of SCM Objectives	221
Figure 6.9: Use of Customer Service Audits	222
Figure 6.10: Elements of Customer Service Measured	222
Figure 6.11: Customer Service and SCM/Supply Chain Design	223
Figure 6.12: Measuring “Total Supply Chain Cost”	223
Figure 6.13: Supply Chain Costing Methodologies	223
Figure 6.14: The Service/Cost Conundrum	224
Figure 6.15: Importance of Integration in SCM	224
Figure 6.16: Extent of Internal Integration	225
Figure 6.17: Extent of Integration with Customers	226
Figure 6.18: Extent of Integration with Suppliers	226
Figure 6.19: Flow Management	227
Figure 6.20: ICT Tools Used	227
Figure 6.21: Nature and Extent of Relationships	228
Figure 6.22: Major Supply Chain Improvement Initiatives	228
Figure 6.23: Size of Respondents’ Firms	229
Figure 6.24: Ownership of Respondents’ Firms	230
Figure 6.25: Headquarters of Multinational Firms	230
Figure 6.26: Respondent Professional Background	230
Figure 6.27: Words Used to Define “Supply Chain”	232
Figure 6.28: Supply Chain Definitions	233
Figure 6.29: Words Used to Define “Supply Chain Management”	234
Figure 6.30: Supply Chain Management Definitions	235
Figure 6.31: Words Used to define “Logistics”	236
Figure 6.32: Logistics Definitions	237
Figure 6.33: Relationships Between SCM and Logistics by Respondent Background	238
Figure 6.34: Factor Map – Relationships Between SCM and Logistics by Respondent Background	238
Figure 6.35: Value of Single-Sentence Definitions by Sector	240
Figure 6.36: Value of Single-Sentence Definitions by Firm Size	241

Figure 6.37: Factor Map – Value of Single-Sentence Definitions by Firm Size	241
Figure 6.38: Value of Single-Sentence Definitions by Firm Ownership	242
Figure 6.39: Factor Map – Value of Single-Sentence Definitions by Ownership	242
Figure 6.40: Value of Single-Sentence Definitions by Respondent Background	243
Figure 6.41: Factor Map – Value of Single-Sentence Definitions by Ownership	243
Figure 6.42: Formulation of SCM Objectives by Firm Size	246
Figure 6.43: Factor Map – Formulation of SCM Objectives by Firm Size	246
Figure 6.44: Formulation of SCM Objectives by Firm Ownership	246
Figure 6.45: Factor Map – Formulation of SCM Objectives by Firm Ownership	247
Figure 6.46: Formulation of SCM Objectives by Respondent Background	247
Figure 6.47: Factor Map – Formulation of SCM Objectives by Respondent Background	248
Figure 6.48: Use of Customer Service Audits by Firm Size	249
Figure 6.49: Factor Map – Use of Customer Service Surveys by Firm Size	249
Figure 6.50: Role of Customer Service in SCM/Supply Chain Design by Firm Size	250
Figure 6.51: Factor Map – the Role of Customer Service in SCM/Supply Chain Design by Firm Size	250
Figure 6.52: Measurement of “Total Supply Chain Cost” by Firm Size	252
Figure 6.53: Factor Map - Measurement of “Total Supply Chain Cost” by Firm Size	252
Figure 6.54: Measurement of “Total Supply Chain Cost” by Firm Size	253
Figure 6.55: Factor Map – Measurement of “Total Supply Chain Cost” by Firm Ownership	252
Figure 6.56: Measurement of “Total Supply Chain Cost” by Firm Size	254
Figure 6.57: Factor Map – Measurement of “Total Supply Chain Cost” by Respondent Background	254
Figure 6.58: Role of Integration in SCM by Sector	257
Figure 6.59: Role of Integration in SCM by Firm Size	258
Figure 6.60: Factor Map – Role of Integration in SCM by Firm Size	258
Figure 6.61: Management of Material Flows by Sector	261
Figure 6.62: Use of ICT Tools by Sector	263
Figure 6.63: Use of ICT Tools by Firm Size	263
Figure 6.64: Factor Map – Use of ICT Tools by Firm Size	264
Figure 6.65: Use of ICT Tools by Firm Ownership	264

Figure 6.66: Factor Map – Use of ICT Tools by Firm Ownership	265
Figure 6.67: Relationships with Customers by Firm Size	267
Figure 6.68: Factor Map – Relationships with Customers by Firm Size	268
Figure 6.69: Relationships with Customers by Firm Ownership	268
Figure 6.70: Factor Map – Relationships with Customers by Firm Ownership	268
Figure 6.71: Supply Chain Improvement Initiatives in the Last Two Years by Sector	271
Figure 6.72: Supply Chain Improvement Initiatives in the Last Two Years by Firm Size	272
Figure 6.73: Factor Map – Supply Chain Improvement Initiatives in the Last Two Years by Firm Size	272
Figure 6.74: Supply Chain Improvement Initiatives in the Last Two Years by Firm Ownership	272
Figure 6.75: Factor Map – Supply Chain Improvement Initiatives in the Last Two Years by Firm Ownership	273
Figure 6.76: Supply Chain Improvement Initiatives in the Last Two Years by Respondent Background	273
Figure 6.77: Types of Improvement Initiatives Implemented in the Last Two Years	274
Figure 6.78: Supply Chain Improvement Initiatives in the Next Two Years by Firm Size	275
Figure 6.79: Factor Map – Supply Chain Improvement Initiatives in the Next Two Years by Firm Size	275
Figure 6.80: Supply Chain Improvement Initiatives in the Next Two Years by Firm Ownership	276
Figure 6.81: Factor Map – Supply Chain Improvement Initiatives in the Next Two Years by Firm Ownership	276
Figure 6.82: Supply Chain Improvement Initiatives in the Next Two Years by Respondent Background	277
Figure 6.83: Types of Improvement Initiatives Planned in the Next Two Years	278
Figure 6.84: Possible Policy Initiatives	279
Figure 6.85: Internal Integration and Information Flow Management	281
Figure 6.86: Factor Map – Internal Integration and Information Flow Management	281
Figure 6.87: Integration with Customers and Information Flow Management	282

Figure 6.88: Integration with Suppliers and Information Flow Management	282
Figure 6.89: Factor Map – Integration with Customers and Information Flow Management	283
Figure 6.90: Factor Map – Integration with Suppliers and Information Flow Management	283
Figure 6.91: Internal Integration and Relationships	284
Figure 6.92: Integration and Relationships with Customers	284
Figure 6.93: Integration and Relationships with Suppliers	285
Figure 6.94: Factor Map – Internal Integration and Relationships	285
Figure 6.95: Factor Map – Integration and Relationships with Customers	286
Figure 6.96: Factor Map – Integration and Relationships with Suppliers	286
Figure 6.97: Overall Contingency Model	287
Figure 6.98: Demographic Data Contingency Model	288
Figure 6.99: Contingency Model (within and between variable groups)	290
Figure 7.1: Critical Success Factors and/or Inhibitors to Success	303
Figure 7.2: Critical Success Factors and the Strategic Alignment Model	309
Figure 7.3: Evolution of <i>Four Fundamentals</i> Concept	313
Figure 8.1: Complementarity of Methods	327



## LIST OF TABLES

Table 2.1: Migration from Lean/Functional to Agile/Customised Supply Chains	22
Table 2.2: Conventional Management and SCM – core concepts	31
Table 2.3: Mega-trends in Supply Chain Logistics	32
Table 2.4: Elements of Customer Service	43
Table 2.5: Stock and Boyer (2009) and the <i>Four Fundamentals</i>	75
Table 2.6: Guidelines on Good SCM Practice	79
Table 2.7: Seven Constructs of SCM	81
Table 2.8: Idealised SCM Characteristics	82
Table 2.9: Focus of SCM Empirical Research	87
Table 3.1: Characteristics of Positivism and Interpretivism	97
Table 3.2: Overall Research Questions	120
Table 3.3: Characteristics of Homogeneous and Heterogeneous Focus Groups	128
Table 3.4: Focus Group Execution	134
Table 3.5: Overview of Focus Group Presentation of the <i>Four Fundamentals</i>	135
Table 3.6: Skills and Roles of Focus Group Facilitator/Moderator	136
Table 3.7: Register of Companies at the End of 2009	142
Table 3.8: NACE Rev. 2 Industry Category Disaggregation	144
Table 3.9: NACE Top-Level Categories Included in and Excluded from the Survey	145
Table 3.10: Number of Firms in the Targeted NACE Top-Level Categories	147
Table 3.11: Number of Firms in the Population by NACE Category	147
Table 3.12: NACE Category G – Breakdown of Population by Level 2 NACE Divisions	149
Table 3.13: NACE Category C – Breakdown of Population by Level 2 NACE Divisions	150
Table 3.14: Sampling Strata Based on NACE Categories and Divisions	153
Table 3.15: Survey Data Requirements in the Form of Detailed Questions	157
Table 3.16: EU Definition of Firm Size	159
Table 4.1: Practitioner Definitions	172
Table 4.2 Interview Findings and the <i>Four Fundamentals</i>	177
Table 5.1: <i>Fundamental One</i> and Focus Group Responses	205
Table 5.2: <i>Fundamental Two</i> and Focus Group Responses	206
Table 5.3: <i>Fundamental Three</i> and Focus Group Responses	206

Table 5.4: <i>Fundamental Four</i> and Focus Group Responses	207
Table 6.1: Final Sample	216
Table 6.2: Emails Returned Undelivered	217
Table 6.3: Response Rates by Sector	219
Table 6.4: Relative Importance of Customer Service, Price and Product Quality	222
Table 6.5: Importance of Different Levels of Integration	225
Table 6.6: Questionnaire Section 1 – Significance of Dependencies	244
Table 6.7: Questionnaire Section 2 – Significance of Dependencies	255
Table 6.8: Internal and External Integration	259
Table 6.9: Questionnaire Section 3 – Significance of Dependencies	260
Table 6.10: Dependence of Material and Financial Flows on Information Flows	265
Table 6.11: Questionnaire Section 4 – Significance of Dependencies	266
Table 6.12: Internal and External Relationships	269
Table 6.13: Questionnaire Section 5 – Significance of Dependencies	269
Table 6.14: Questionnaire Section 6 – Significance of Dependencies	280
Table 6.15: SCM Adoption	293
Table 7.1: Possible Measures to Improve SCM Adoption	310

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Introduction**

This introductory chapter provides some general background to the research carried out by the author (section 1.2) before going on to explain the context (Ireland) in which the empirical work was carried out (section 1.3). The chapter then explains the specific problem that provides the focus for the author's work and justifies the work as meaningful research, and allows the author to describe the overall approach adopted (section 1.4). This leads to a description of the rationale for the overall structure of this thesis, as well as an explanation of the main purpose of each of the thesis' constituent chapters (section 1.5). The chapter then summarises some of the main issues by way of conclusion (section 1.6).

### **1.2 Background to Research**

Since its introduction by management consultants in the early 1980s, the supply chain management (SCM) concept has risen to prominence in both academic and commercial circles. A substantial body of academic knowledge has been, and continues to be, developed in the broad SCM domain. There is significant evidence that the effective implementation of SCM can result in improvements in the performance of firms. For example, on the basis of a study of 196 firms, Li et al. (2006) concluded that higher levels of SCM practice "can lead to enhanced competitive advantage and improved organizational performance" (p. 107). Similarly, the work of Frohlich and Westbrook (2001) based on a survey of 322 global manufacturers strongly supported the hypothesis that companies with the "greatest extent of supplier and customer integration will have the largest rates of performance improvement" (p. 193). This is significant given the centrality of integration in SCM philosophy.

However, Fabbe-Costes and Jahre (2008), based on a systematic review of 38 papers on the subject of supply chain integration (SCI) note that:

Even though half of the papers of our total sample conclude that SCI has a positive effect on performance, the variety of empirical bases and the research design of the studies suggest that caution is advisable (p. 140).

In a similar vein, Storey et al. (2006) assert that, “while there is an emerging body of theory which ostensibly offers a relatively coherent and compelling prescriptive narrative, predominant practice is at considerable odds with this conceptualisation” (p. 755). Carter and Narasimhan (1994) noted that the incorporation of SCM into the overall business planning process is not widely practiced. As noted earlier, the concept of integration lies at the heart of SCM philosophy. However, there is significant evidence of a divergence between theory and practice in this core area. For example, Storey et al. (2006) recognise that supply chain theory suggests that the chain should be managed from end-to-end but note that, “our research found very few examples of this” (p. 763). The work of Fabbe-Costes and Jahre (2007) concluded that, “at this point in time it seems that we can confirm that integration is more rhetoric than reality, that it might be more difficult in practice than in theory” (p. 848). Their more recent work (Fabbe-Costes and Jahre, 2008) reinforces this view. A number of other authors have raised serious questions about the real impact of SCM in practice. For example, Cousins et al. (2006) suggested that:

SCM still appears to suffer from an underlying frustration or perception of being largely ignored; practitioners feel they have a great deal of value to add, but the organisation is not concerned with them (p. 699).

In short, there is evidence to suggest that there are – as Storey et al. (2006) put it – “substantial gaps between theory and practice” (p. 769). This raises important questions concerning the real impact of SCM theory in practice. The fundamental purpose of the research described in this thesis is to disentangle the rhetoric from the reality in relation to SCM adoption in practice with specific reference to the situation in Ireland.

SCM is not new. The term may be relatively new, but supply chains have existed for a very long time – in fact they have probably always existed! For example, Forrester’s often cited article from the *Harvard Business Review* in 1958 (Forrester, 1958) stated that:

Management is on the verge of a major breakthrough in understanding how industrial company success depends on the interactions between the flows of information, materials, money, manpower, and capital equipment. The way these five flow systems interlock to amplify one another and to cause change and

fluctuation will form the basis for anticipating the effects of decisions, policies, organisational forms, and investment choices (p. 37).

If, as Forrester suggested, management was on “the verge of a major breakthrough” over half a century ago, it seems pertinent to raise questions concerning how this breakthrough – mainly in relation to managing relationships between supply chain companies – has impacted on companies in reality. In fact, over 40 years after Forrester’s article first appeared, Mentzer et al. (2001, p. 20), in concluding their paper, asked the question – “how prevalent is SCM?” More recently, Kotzab et al. (2011, p. 233) noted that the general agreement among researchers in relation to the positive effects of SCM on an organisation’s performance “lacks empirical support as most research provides mostly anecdotal evidence” and that “there is a dearth of evidence in relation to the extent to which SCM – as defined in the academic literature – is implemented or even understood in practice”. The research described in this thesis attempts to provide some insights into this key question and the issues that it raises, specifically in an Irish context.

### **1.3 Context of Research**

Ireland is a small, open, trade-dependent nation and between the mid-1990s and 2007 was one of the fastest growing economies in the developed world. During that period of unprecedented economic growth the level of Irish real gross domestic product (GDP) almost doubled in size and the Irish economy was transformed from its historical agrarian and traditional manufacturing base to one increasingly based on the hi-tech and internationally traded services sectors (ESRI, 2005). These “Celtic Tiger” years are reflected in, for example, headlines in *The Economist* such as: ‘Ireland: Europe’s tiger economy’ and ‘Ireland shines’ (Economist, 1997); ‘Tiger, tiger, burning bright’; and, ‘Lessons from the Irish miracle’ (Economist, 2004). Since 2007 there has been a serious contraction in the size of the economy with crises in the banking and property sectors – as well as high levels of government, corporate and personal debt – contributing to one of the deepest recessionary periods ever seen in any modern economy (ESRI, 2011). This is reflected in more recent headlines in *The Economist* with a somewhat different tenor such as: ‘The emerald shines no longer: Irish eyes are not smiling’ (Economist, 2010); ‘The many stages of grief’ (Economist, 2011); and, ‘The muck of the Irish’ (Economist, 2012).

Nonetheless, Ireland's economy continues to be one of the most open in the world. The high share of combined imports and exports in GDP (for example, over 180% in 2010) and the continuing high levels of foreign direct investment (FDI) capital inflows are illustrations of this openness (ESRI, 2011). In absolute terms, the latter are by far the largest in the European Union (EU) in per capita terms. Throughout this difficult economic period the export sector proved remarkably resilient. For example, according to the Economic and Social Research Institute (ESRI), merchandise exports increased by 6% in value in 2010 (ESRI, 2011). Government policy has a strong emphasis on export-led growth as the key to economic recovery (see, for example, DJEI, 2011). In this context, logistics and SCM are critically important.

A number of other issues combine to make logistics and SCM particularly important in an Irish context (see for example: Forfas, 1995; Sweeney et al., 2008). The country's relatively peripheral location, and the fact that it is an island, results in transportation costs for companies based in Ireland being higher than those in more favourable locations. Furthermore, the corporate taxation regime (in particular the 12.5% tax rate on service businesses) makes the option of companies establishing business units (profit centres) in Ireland with responsibility for the management of supply chain activities attractive. One of the challenges in this scenario is the ability of Irish businesses to manage increasingly complex and global supply chain configurations. Excellence in SCM can offset the physical disadvantage posed by Ireland's geographic location by securing savings elsewhere in the wider supply chain, as well as by generating improvements in customer service levels.

#### **1.4 Research Problem and Overall Approach**

As noted in section 1.2, the fundamental purpose of the research described in this thesis is to disentangle the rhetoric from the reality in relation to SCM adoption in practice with specific reference to the situation in Ireland. With this in mind, the author's work comprised two main components. The first was a comprehensive literature review in the SCM domain with specific reference to the divergence between theory and practice. This informed the development of a set of four research questions (RQs) to be explored specifically in an Irish context:

**RQ1** – What is the current level of understanding of SCM in practice?

**RQ2** – What is the current level of adoption of SCM?

**RQ3** – What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?

**RQ4** – What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?

As noted earlier, the literature suggests that the extent to which SCM is implemented in practice is unclear. Furthermore, there is evidence of a lack of clarity and consistency in terms of how SCM is defined and understood. RQ1 aims to address this issue by exploring the level of SCM understanding in practice. It is the author's contention that effective implementation of SCM is predicated upon such an understanding – i.e. something that is not well understood can not easily be implemented. Hence, before exploring the extent to which SCM is being adopted – the focus of RQ2 – there is a need for clarity in relation to the extent to which the concept is understood, i.e. the focus of RQ1. The factors upon which SCM adoption depends is then the focus of RQ3 with its emphasis on the identification of critical success factors and/or inhibitors to success in putting SCM theory into practice. This is the key question that needs to be answered if the divergence between theory and practice identified in the extant literature is to be better understood. Based on this, RQ4 goes on to identify measures that could be implemented to improve the level of SCM adoption. It is intended that this will focus on possible policy-level interventions, as well as on possible supply chain and firm level measures.

The second component of the author's work – the empirical research – aims to generate insights into these questions. The research design is based on the concept of methodological pluralism and comprises three main phases: (i) focussed interviews; (ii) focus groups; and, (iii) a questionnaire survey. While each phase of the work specifically aims to address one or more specific questions, it is the effective use of a range of appropriate methods as part of an overall integrated research design that is of most importance. Many scholars have discussed the lack of a robust theoretical foundation in the SCM field and several attempts have been made to address this perceived challenge with varying degrees of success. At present there is certainly no universally agreed upon unified theory of SCM. For example, Halldorsson et al. (2007) concluded that "the main message in this paper is that there is no such thing as a

‘unified theory of SCM’” (p. 292). The adoption of combinatory methodological approaches by the author is aimed at ensuring that the empirical work carried out:

1. Is of practical value to practitioners and policy-makers by providing a detailed understanding of the current SCM landscape in Ireland; and,
2. Contributes in a meaningful way to the further development of critical SCM theory across the range of domains addressed.

Thus, this research does not aim to be simply an exercise in fact-finding in an Irish context; it also seeks to support the building and testing of SCM theory with Ireland merely serving as an appropriate context for this work.

## 1.5 Thesis Structure

The overall structure of this thesis is illustrated in Figure 1.1 (below).

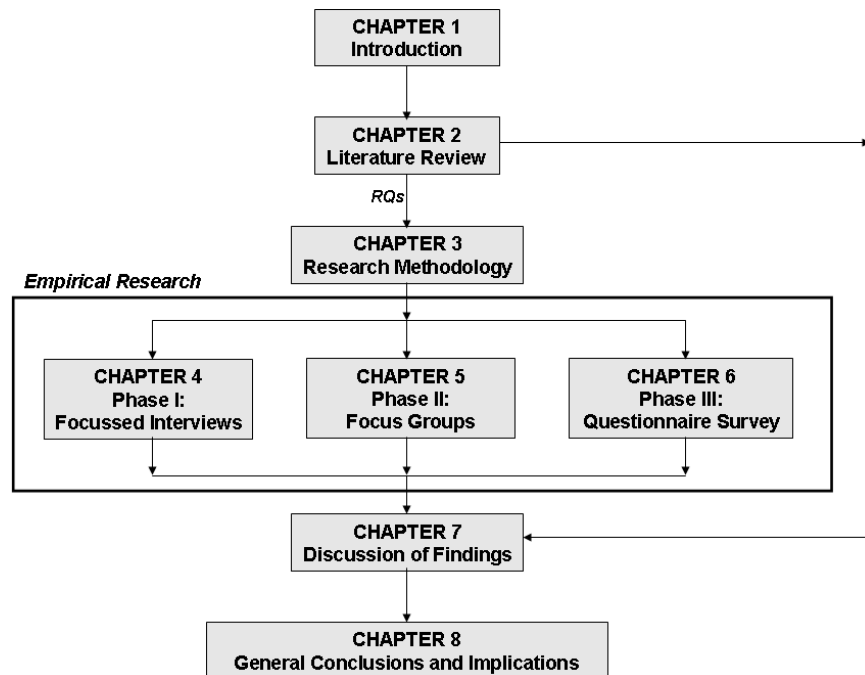


Figure 1.1: Structure of Thesis

Following this introduction, **Chapter 2** goes on to describe the author’s comprehensive literature review. The initial part of this review highlights the importance of agreed upon definitional constructs and the author posits his own definition – the *Four Fundamentals* – based on the extant literature reviewed. The literature review also informed the development of the four main RQs (see section 1.4) that provide a focus for the author’s empirical work.



**Chapter 3** then discusses research in the SCM and logistics domains from philosophical and methodological perspectives, as well as in terms of a range of data collection and analysis methods and techniques. This leads to the development of the author's empirical research design based around its three main constituent phases. The remainder of the chapter explains the design of each of these phases in some detail

**Chapters 4, 5 and 6** go on to discuss the data collection and analysis through each of the three main phases of the empirical research – i.e. focussed interviews, focus groups and the questionnaire survey, respectively. In each case, the data that were collected are presented and insights are provided into the various RQs based on a detailed analysis of these data.

**Chapter 7** integrates the work described in the previous chapters. It does so by firstly discussing the findings from the three phases of the author's empirical research in a holistic and integrated manner. It goes on to relate these findings to the existing body of scholarly knowledge using the author's *Four Fundamentals* construct and other relevant themes from the literature review in Chapter 2 as a basis.

**Chapter 8** summarises the main contributions of the research described in this thesis, both in terms of the scholarly body of knowledge and from a methodological perspective. It goes on to identify some key implications for both supply chain practitioners and policy makers. The limitations of the work are also highlighted, leading directly to a number of suggestions for future potentially fruitful research avenues in the field.

## **1.6 Summary**

This chapter has laid the foundations for this thesis. It has introduced the research background and context and set out the research problem and questions to be addressed. The methodology was briefly described and justified – this will be explored in more detail in Chapter 3. Finally, the outline of the thesis was presented. On these foundations the thesis can proceed with the author's detailed review of the extant literature in Chapter 2.

## CHAPTER 2

# LITERATURE REVIEW: UNDERSTANDING SUPPLY CHAIN MANAGEMENT

### 2.1 General Background to Literature Review

Embarking on a literature review in the field of supply chain management (SCM) is fraught with difficulty. As stated by Cousins et al. (2006):

To an extent, SCM suffers (or benefits) from being studied from a wide range of academic disciplines and diverse theoretical perspectives. On the one hand this encourages a rich and lively debate, but it may also lead to a fragmented literature, with overlapping constructs and a failure to produce consistent findings (p. 701).

Similarly, Storey et al. (2006) note in their major SCM literature review, that the field is characterised by fragmentation. In their bibliographic review of recent SCM literature, Charvet et al. (2008) observe “an explosion of interest across disciplines and journals” (p. 64) but note that “there appear to be multiple broad streams of research that are developing relatively independently of each other” (p. 65). Lejeune and Yakova (2005) suggest that the diverse nature of SCM literature is a product of two factors: firstly, the field is at “the confluence of many other disciplines”; secondly, it “comprises different inbound and outbound entities operating at various stages (i.e. procurement, production, distribution) in the supply chain” (p. 82). In other words, SCM is both multidisciplinary and multifunctional. Croom et al. (2000) identify 11 “subject areas we consider to be core to any supply chain management literature survey as a discipline”<sup>1</sup>.

Bechtel and Jayaram (1997) identified nine “content literature areas” and five “process literature areas” (p. 21). The former refer to literature related largely to traditional functional areas (e.g. purchasing and distribution) while the latter refer to literature related largely to SCM enablers such as information technology (IT) and performance measures. Otto and Kotzab (2003) “identified six possibilities to look at SCM” (p. 308): systems dynamics, operations research, logistics, marketing, organisation and strategy. Chen and Paulraj (2004a) identify a number of specific fields (i.e. purchasing and

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<sup>1</sup> Purchasing and supply; logistics and transportation; marketing; organisational behaviour, industrial organisation, transaction cost economics and contract view; contingency theory; institutional sociology; systems engineering; networks; ‘best practices’; strategic management; and economic development.

supply, logistics and transportation, operations management, marketing, organizational theory, management information systems and strategic management) all of which have contributed to the explosion of SCM literature.

This proliferation of SCM literature has prompted scholars to classify the literature in various ways. For example, Tan (2001) illustrates the evolution of SCM from both a purchasing and supply perspective, as well as a transportation and logistics perspective. Harland et al. (1999) classified research in this area according to the level of integration between supply chain activities. The four levels are:

1. Internal level, which considers only those activities which are entirely internal to the focal company;
2. Dyadic level, which considers single two-party relationships (between, for example, supplier and manufacturer or manufacturer and distributor/retailer);
3. Chain level, which encompasses a set of dyadic relationships including a supplier, a supplier's supplier, a customer and a customer's customer; and,
4. Network level, which concerns a wider network of operations.

Storey et al. (2006) note that the precepts of SCM as portrayed in the literature are a mix of description, prescription and the identification of trends. They suggest that the literature “tends to move rather imperceptibly” (p. 757) between these three elements. Lejeune and Yakova (2005) suggest that existing SCM literature classification frameworks are based on the following six criteria. (p. 83):

1. Type of inter-functional integration;
2. Type of issues faced in SCM;
3. Type of modelling techniques used in SCM;
4. Methodology used and content addressed;
5. Type of product (functional or innovative) and supply chain strategy; and,
6. Level of supply chain integration.

Chen and Paulraj (2004b) examined over 400 articles from several diverse disciplines in what they claim “may be the most comprehensive analysis of the multidisciplinary, wide-ranging research on SCM” (p. 132) – see Appendix 1. This is amalgamated into their proposed theoretical framework for SCM research based around the main thematic areas of strategic purchasing, supply management, logistics integration, supply network coordination and supply chain performance. Figure 2.1 (below) shows the proposed framework.

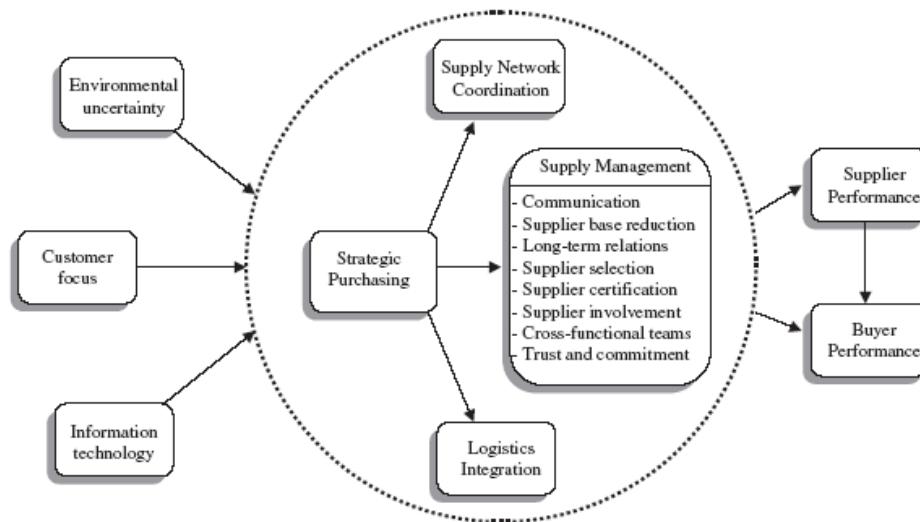


Figure 2.1: Theoretical Framework for SCM Research<sup>2</sup>  
Source: Chen and Paulraj (2004b, p. 133)

Furthermore, a plethora of supply chain management (SCM) definitions have been developed in recent years. There is evidence of differences in emphasis and approach between different industrial sectors, geographical areas and functional backgrounds. Furthermore, a variety of associated terminologies have also been developed which has added to the complexity. As noted by Ross (1998), this can limit management's understanding of the SCM concept and the practical effectiveness of its application. Nonetheless, SCM has risen to prominence in recent years in both academic and commercial circles. The number of professional bodies involved in the area is also a reflection of the growth in interest in the subject. However, there is still no universally accepted definition of what SCM is (and, indeed, is not). As pointed out in a widely cited article by Mentzer et al. (2001, p.2):

Despite the popularity of the term Supply Chain Management, both in academia and practice, there remains considerable confusion as to its meaning. Some authors describe SCM in operations terms involving flow of products and materials, some view it as a management philosophy, and some view it as a management process.

Given the quantity and range of SCM literature, the review set out in this Chapter is structured around a number of specific thematic areas and comprises 16 sections as shown in Figure 2.2 (below).

<sup>2</sup> Literature references associated with each of the main areas and their constituent sub-areas are shown in Appendix 1.

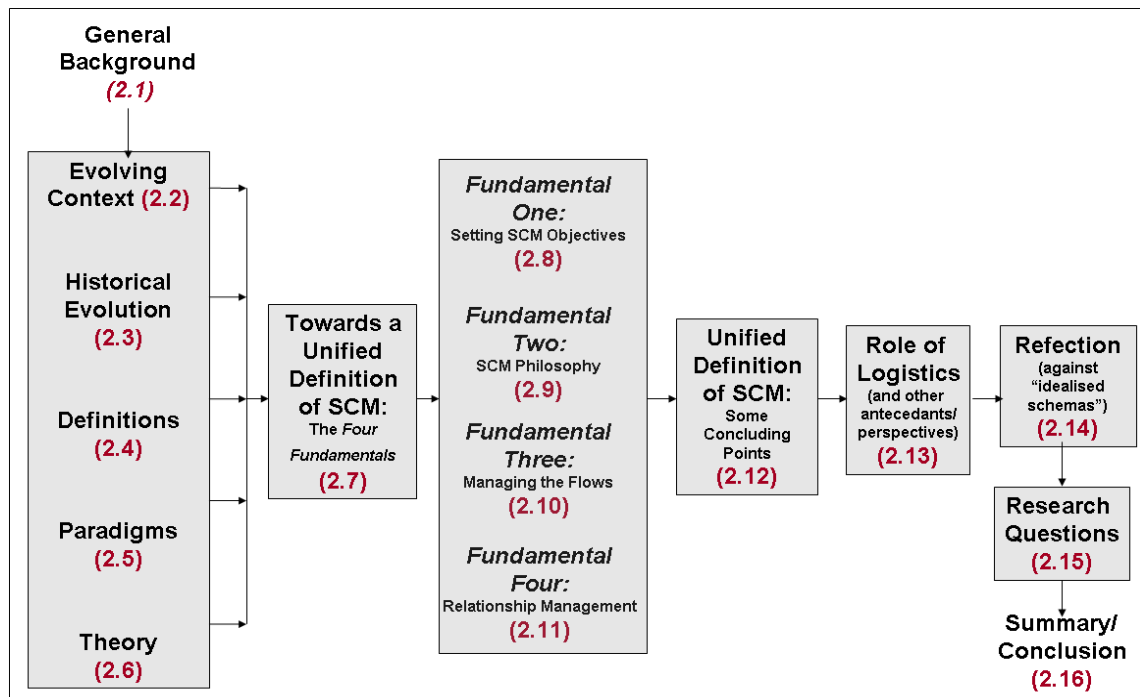


Figure 2.2: Structure of Chapter 2

Section 2.2 provides an overview of the evolving context of SCM based on a number of factors which are changing the global supply chain landscape. Section 2.3 then examines the historical evolution of SCM since its introduction by consultants in the early 1980s. Many definitions of SCM have been proposed, each of which has a particular focus and emphasis. Section 2.4 introduces and critiques some of the most widely cited definitions. Several authors have attempted to define SCM with reference to more traditional and conventional approaches to business management. Section 2.5 sets out a number of these “paradigm shift” approaches in an effort to illustrate some of the key features of contemporary SCM. Section 2.6 then explores the theoretical basis of the subject and concludes that there is a need for more robust and widely adopted theories. Section 2.7 goes on to introduce the author’s definition of SCM based on the *Four Fundamentals* of SCM. As shown in Figure 2.2, these five bodies of knowledge informed the development of the *Four Fundamentals* – each of which is described in sections 2.8 to 2.11 – with section 2.12 making some concluding observations about the construct. Section 2.13 explains the role within SCM of one of its principal antecedents, namely logistics, as well as the relationship between SCM and other established subject domains. Section 2.14 then reflects on the *Four Fundamentals* with particular reference to various sets of guidelines on good SCM practice (or “idealised schemas”) and argues that they represent something more than simply a definition of SCM. Based on the

foregoing, section 2.15 sets out the research questions to be explored in this thesis. Finally, some general observations are made in section 2.16 by way of conclusion.

## **2.2 The Evolving Supply Chain Management Context**

### ***2.2.1 Introduction***

The literature suggests that a number of key issues are changing the supply chain management (SCM) and logistics strategic landscape. For example, Hameri and Hintsa (2009) identified several trends and drivers of change in a recent study commissioned by the World Customs Organisation (WCO)<sup>3</sup>. Arguably, the three most significant such issues are:

1. Internationalisation (or globalisation) of supply chains;
2. Vertical disintegration; and,
3. The changing role of the supply chain as a source of strategic leverage.

Sweeney (2007) asserts that this is in line with much of the published work. For example, Storey et al. (2006, p. 769) point out that their work “concurred with the literature in identifying globalisation, outsourcing and fragmentation as three major drivers”. Vertical disintegration is largely a consequence of outsourcing, while fragmentation in this context refers to strategic leverage, particularly in the context of product strategy<sup>4</sup>. Internationalisation is being driven by changing structures in the international economic and business environment. Vertical disintegration and the changing strategic view of the supply chain are both parts of the strategic response of firms to competitive pressures in the marketplace. The author recognises that these three issues are in many ways interrelated and interdependent<sup>5</sup>. Nonetheless, the following sections discuss each of these issues in some detail.

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<sup>3</sup> They are related to increased off-shoring of operations through truly global manufacturing, characterized by its intercontinental supply of materials; increased product complexity with shorter product life cycles; increased importance of business-to-government networking for operational and security efficiency; introduction of new supply chain services integrating financial, physical and information flows leading to further consolidation in the logistics markets; and the overall increase in risks and vulnerabilities in international supply chains. increased importance of business-to-government networking for operational and security efficiency; introduction of new supply chain services integrating financial, physical and information flows leading to further consolidation in the logistics markets; and the overall increase in risks and vulnerabilities in international supply chains.

<sup>4</sup> Fragmentation refers to, for example, SKU proliferation, shortening product life cycles and the requirement for increased customisation.

<sup>5</sup> For example, outsourcing of manufacturing to lower labour cost economies is facilitated by economic liberalisation in these countries.

### **2.2.2 Internationalisation**

The structure of the international economic and business environment has changed significantly in recent years. The growth of trade blocs throughout the world has resulted in increasing global economic integration. This evolution, largely based on the reduction of barriers to the movement of capital, goods, services, people and information internationally, has facilitated increased international trade and foreign direct investment (FDI). The value of world merchandise trade reached about \$6.07 trillion in 2002. In 1990 it was less than \$2.85 trillion (UN, 2004). According to the World Trade Organisation (WTO), international trade flows multiplied by a factor of 25 between 1950 and 2003 (WTO, 2004). Annual foreign direct investment (FDI) expanded over 19-fold between 1973 and 2004, that is from \$21.5 billion to over \$410 billion (UNCTAD, 2004). These trends have resulted in the increasing internationalisation of supply chains. This can be related to the “buy–make–move–sell” model of product supply chains (New, 1997; NITL, 2000).

**Buy.** Global sourcing of raw materials and other inputs has now become a reality for many organisations as the structure of the international economic and business environment has evolved (Fagan, 1991; Trent and Monczka, 2003). The WTO provides an interesting example in its 1998 annual report (WTO, 1998). In the production of an “American” car, 30 per cent of the car’s value originates in Korea, 17.5 per cent in Japan, 7.5 per cent in Germany, 4 per cent in Taiwan and Singapore, 2.5 per cent in the United Kingdom and 1.5 per cent in Ireland and Barbados. That is, “... only 37 per cent of the production value ... is generated in the United States”. This phenomenon is large enough to be noticed in aggregate statistics. Feenstra and Hanson (1996) used US input–output tables to infer US imports of intermediate inputs. They found that the share of imported intermediates increased from 5.3 per cent of total US intermediate purchases in 1972 to 11.6 per cent in 1990. Campa and Goldberg (1997) found similar evidence for Canada and the UK.

**Make.** Access to lower cost manufacturing worldwide is now possible. For example, the expansion of China in recent years, based to a large extent on outsourcing (or “offshoring”) of labour-intensive manufacturing by companies from developed countries, is indicative of this. No other country has attracted as much FDI as China. In 2004, approximately \$60 billion of FDI was absorbed; between 1979 and 2004, the total was approximately \$560 billion (UNCTAD, 2004). As a result China is growing rapidly

and attaining pre-eminence in global manufacturing in certain sectors. For example, by 2005 the country was already producing 50 per cent of the world's cameras, 30 per cent of air conditioners and televisions, 25 per cent of washing machines and 20 per cent of refrigerators (Pinto, 2005). Similar trends have occurred in Eastern Europe. For example, *The Economist* (2001) has noted strong and growing FDI flows into the region in the period leading up to EU enlargement in 2004.

**Move.** The above has implications for the logistics and distribution strategies of companies (Waters, 2004). Increased trade volumes globally have created the need for new logistics pipelines. The growth in the international third party logistics (3PL) sector is a reflection of this. The large number of mergers and acquisitions in the sector has been driven significantly by the desire of companies to have a stronger global presence (Eyefortransport, 2001). With specific reference to the European freight industry, Peters (2000) noted that growth in the 1990s has offered a lesson that "the country-by-country model for logistics is no longer valid; companies have begun to reorganize themselves into continental operations based on integration and rationalisation" (p. 171).

**Sell.** Furthermore, as markets have opened up internationally for a range of products and services, international (and in some cases global) selling has become the reality. The cases of China and India are worthy of particular comment. As pointed out in a survey in *The Economist* (2005), the two countries are home to nearly two-fifths of the world's population and are two of the world's fastest-growing economies. A report by America's National Intelligence Council (2004) likened their emergence in the early 21st century to the rise of Germany in the 19th and America in the 20th century, with "impacts potentially as dramatic". The liberalisation of markets has sharpened the focus on the need for more robust approaches to international marketing strategy (Bradley, 2004; Cateora and Graham, 2004). For example, the term "glocalisation" (from "global" and "localisation") has been used to refer to the creation of the local (country or regional) market presence of a global enterprise (Fan and Huang, 2002).

In short, as economic and business globalisation has happened so supply chain architectures have become more global. The resulting challenges in terms of SCM and supply chain design (SCD) have been the subject of significant research, debate and discussion (for example: Arntzen et al., 1995; Gourdin, 2000; Simchi-Levi et al., 2002; Bolstorff and Rosenbaum, 2003; Ayers, 2003).



### ***2.2.3 Vertical Disintegration***

Companies are increasingly focusing on what they regard as their core activities or competencies. Oates (1998) defines core competencies as the central things that organisations do well. The corollary of this is that activities regarded as “non-core” are often being outsourced. Greaver (1999, p. 70) states that “non-core competencies take up time, energy and workspace, and help management lose sight of what is important in an organisation“. Furthermore, the trend towards economic and business globalisation has facilitated the outsourcing of various activities to overseas locations (offshoring – see above). Key supply chain activities are increasingly being outsourced to third-party organisations. This can again be related to the “buy–make–move–sell” model of product supply chains.

**Buy.** Purchasing and procurement activities have generally not been outsourced in the traditional sense but the development of purchasing consortia has meant some sharing of responsibility for this activity between companies. Hendrick (1997, p. 1) defines a purchasing consortium as:

A formal or informal arrangement, where two or more organisations, who are separate legal entities, collaborate among themselves, or through a third party, to combine their individual needs for products from suppliers and to gain the increased pricing, quality and service advantages associated with volume buying.

Essig (1999) notes that a purchasing consortium is often just one element of an overall supply strategy.

**Make.** The classic “make versus buy” decision has been a central theme in the field of manufacturing strategy for decades (for example, Hayes and Wheelwright, 1984). The traditional focus was largely on the financial and economic analysis of in-house versus outsourced options for particular processes within a manufacturing operation. Manufacturing outsourcing decision-making processes now tend to take a broader and more strategic view (for example, Hill, 1999). Many large manufacturers have outsourced significant parts of their production activity to third parties (for example: Edwards and Edwards, 2000; Hassey and Lai, 2003). For example, in the electronics sector the trend is one of original equipment manufacturers (OEMs) outsourcing significant amounts of manufacturing to contract manufacturing companies. Companies

in the electronic manufacturing services (EMS) sector, such as Flextronics, Foxconn and Celestica<sup>6</sup>, have grown rapidly as a result.

**Move.** In recent decades, transport and a range of other logistics activities have been outsourced by manufacturers and retailers (Scott and Westbrook, 1991; McKinnon, 1999). The 3PL sector has developed rapidly as it has responded to its customers' requirements for the supply of tailor-made services (Razzaque and Sheng, 1998; Skjoett-Larsen, 2000). The European Union PROTRANS project (PROTRANS, 2003) developed a definition of 3PL based on a wide number of definitions which have appeared in the literature:

Third-party logistics are activities carried out by an external company on behalf of a shipper and consisting of at least the provision of management of multiple logistics services. These activities are offered in an integrated way, not on a stand-alone basis. The co-operation between the shipper and the external company is an intended continuous relationship.

This definition reflects the manner in which shippers' requirements have evolved in recent years. The emphasis now is on the provision of integrated multiple services and the development of relationships.

**Sell.** Selling as a process has generally not been outsourced in the traditional sense. Nonetheless, many of the individual activities which comprise sales channels may be owned by other companies. The actual selling of products to consumers may be carried out by retailers, who may in turn obtain the products from wholesalers; third-party owned and managed call centres may be an integral part of the selling process; third-party agents, franchisees or distributors may also have some responsibility (for example, Friedman and Furey, 1999).

The above has resulted in a shift away from the traditional model of "control through ownership" towards models which are based on management and control through effective supply chain relationship management. The former is based on the strategic logic of vertical integration. Vertical integration is the degree to which a firm owns its upstream suppliers and its downstream buyers (Greaver, 1999). Harrigan (1999) provides a good description of the logic underpinning this approach to strategic development. The latter, effectively a process of vertical disintegration, has taken place

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<sup>6</sup> See [www.flextronics.com](http://www.flextronics.com), [www.foxconn.com](http://www.foxconn.com), [www.celestica.com](http://www.celestica.com)

as a result of the trends outlined above (Mpoyi, 1999; Langlois, 2001). Recent developments in information and communications technology (ICT), in particular Internet technologies, have facilitated this process and laid the foundations for the “network economy model” (Reddy and Reddy, 2001). According to Hugos (2002) traditional supply chain models have given way to virtual integration of companies. In short, as outsourcing of various elements of supply chain functionality takes place, supply chain architectures are becoming more virtual. The traditional *fully vertically integrated* approaches are being replaced by contemporary *fully virtually integrated* approaches – a new FVI is evolving.

#### **2.2.4 Strategic Leverage**

Classically in the field of strategic management the generic approaches of cost leadership, differentiation and focus have been identified (Porter, 1980). Porter’s classic text described these alternatives, as follows:

- A cost leadership strategy requires a company to be a low cost supplier, and to sell either at below average industry prices to gain market share, or at industry average prices to earn a profit higher than that of rivals;
- A differentiation strategy requires a product or service that offers unique attributes that are valued by customers, thereby allow premium pricing; and,
- A focus strategy concentrates on a narrow segment and within that segment attempts to achieve advantage through either cost leadership or differentiation.

A significant proportion of the overall cost base of companies is in the supply chain. In the automotive industry, for example, A.T. Kearney (1999) reported that typically component (30 per cent), manufacturing and assembly (28 per cent) and distribution (four per cent) costs together represent 62 per cent of sales price. Hence, any worthwhile cost leadership approach needs to focus on the optimisation of total supply chain costs and the elimination of non-value-adding activities (NVAs). An NVA may be defined as<sup>7</sup>: *any activity (or resource or asset) that adds cost (or time) to any supply chain process without adding value from a customer perspective*. Much of this lean thinking has its origins in the Japanese automotive industry, in particular in the Toyota Production System (TPS) and the just in time (JIT) paradigm (Ohno, 1988; Womack and Jones, 2003). The main objective of this thinking was the elimination of waste (or

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<sup>7</sup> Author’s definition based on Jones et al. (1997), Goldratt and Cox (1992), Womack and Jones (2003) and others.

“muda” in Japanese). Christopher and Gattorna (2005) present evidence that effective SCM provides “opportunities for significant cost reduction and increased profits” (p. 115).

Customer service is becoming a key source of differentiation or an order winning criterion in many sectors (Christopher, 2005). An order winning criterion (or order winner) is a feature of the product or service offering which differentiates it from the competition and is, therefore, likely to be a source of increased market share; an order qualifier, on the other hand, is a feature which must exist to ensure that a product or service gets into the market in the first instance and stays there (Hill, 1999). The latter – i.e. order qualifiers – tend to have order losing rather than order winning characteristics. In many sectors the importance of customer service relative to product quality (now largely an order qualifier) and price (largely determined by the dynamics of supply and demand in the market and subject to downward pressure in many sectors) has increased (Sweeney, 2004). Customer service is delivered by the supply chain. In this way, the supply chain itself has become a key factor in the development of a differentiation strategy.

As pointed out earlier, a focus strategy concentrates on a narrow segment and within that segment attempts to achieve advantage through either cost leadership or differentiation. The points made above in relation to the role of SCM in strategy formulation and implementation are, therefore, equally relevant in the context of a focus approach.

In short, a company pursuing a cost leadership, a differentiation, or a focus strategy can leverage the supply chain as a fundamental element of its effort to improve competitive performance. The role of SCM in strategy formulation and implementation is given extensive treatment in the literature (for example: Simchi-Levi and Kaminsky, 2003; van Hoek and Harrison, 2004; Cohen and Roussel, 2004). Two approaches are worthy of particular mention.

Firstly, Christopher and Ryals (1999) argued that SCM has a central position in the creation of shareholder value. In this context shareholder value is defined as the financial value created for shareholders in the companies in which they invest. The four basic drivers of enhanced shareholder value (i.e. revenue growth, operating cost

reduction, fixed and working capital efficiency) are directly and indirectly affected by logistics management and supply chain strategy. The framework of value-based management (VBM) plays a potentially important role in achieving these improvements in practice. The paper concludes by noting that, “By seeking out opportunities for partnership in the supply chain combined with an emphasis on the reduction of non-value-adding time, the evidence suggests, enduring improvement in shareholder value can be achieved” (p.9). The emphasis on time compression is important as it has the potential to reduce cost and improve customer service simultaneously (see section 2.8.4).

Secondly, a graphical representation of Gattorna’s “Strategic Alignment Model” is shown in Figure 2.3 (Gattorna et al., 2003). He argues that the empirical evidence suggests that if organisations are to achieve sustained high levels of financial and operating performance, the four elements shown in the diagram must be dynamically aligned.

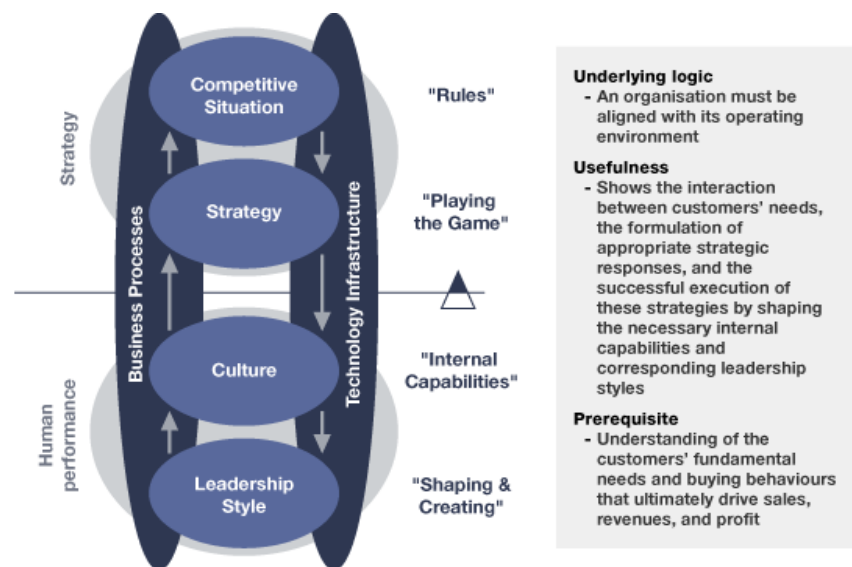


Figure 2.3: The Strategic Alignment Model  
Source: Gattorna et al. (2003, p. 5)

Alignment in this context means:

- an understanding of customers' buying behaviour;
- corresponding value propositions to align with the dominant buying behaviours;
- the appropriate capabilities (or cultural capability) embedded in the organisation to underpin the delivery of these specific value propositions; and,

- a composite leadership style at the executive level to ensure the appropriate sub-cultures are in place as required.

Organisations seeking superior performance must be both very aware of their customers' expectations and of their own internal capability. If these two dimensions are addressed adequately, then an organisation is fully aligned with its marketplace. This is in line with classical approaches to strategy formulation – for example, Porter (1980, p. 3) states that “the essence of formulating a competitive strategy is relating the company to its environment” – but with a strong focus on the role of SCM in ensuring that strategic plans are realised in practice. In this context, Sun et al. (2009) emphasise the importance of alignment between supply chain strategy and uncertainty in the firm's business environment.

### ***2.2.5 Concluding Comments***

Economic and business globalisation is happening. Companies are increasingly focussing on their core competencies and as a result vertical disintegration has emerged. Finally, more and more companies are beginning to regard the supply chain as a source of strategic leverage. In short, supply chains have become more global and more virtual (and, therefore, their management has become more complex) and SCM is becoming a more integral and integrated part of overall corporate strategy. Simultaneously, customers have become more discerning and are demanding better quality products, higher levels of service and reduced prices. This increasingly competitive business environment has sharpened the focus on the need for more robust approaches to supply chain design and management.

## **2.3 Historical Evolution of SCM**

The term SCM was originally introduced by management consultants in the early 1980s (Oliver and Webber, 1982). Since then several attempts have been made to place contemporary SCM thinking in an historical context and/or to plot its historical development and evolution. The following sections provide an overview of three of the more useful and widely cited approaches. They also provide a framework for describing some key concepts and models which are now effectively constituent elements of the overall integrated SCM paradigm.

### 2.3.1 Fragmentation to Integration Model

Battaglia (1994) developed a model which indicates the way in which SCM has evolved from its main constituent functions from the 1960s to date (see Figure 2.4). It indicates that the evolution has involved a shift from highly fragmented to much more integrated approaches with the 1990s characterised as the decade of “Total Integration”.

During the “Evolving Integration” decade (the 1980s) various functional areas became integrated into *materials management* and *physical distribution* – these then became further integrated under the *logistics* umbrella. SCM extends this integration further by linking logistics with manufacturing, information technology (IT), marketing, sales and strategic planning. The model provides a useful visual representation of the way in which companies have attempted to move away from the functional stovepipe or silo approach to more integrated approaches, facilitated by IT. It is interesting to note that this model is analogous to two other three-phase approaches to logistics evolution.

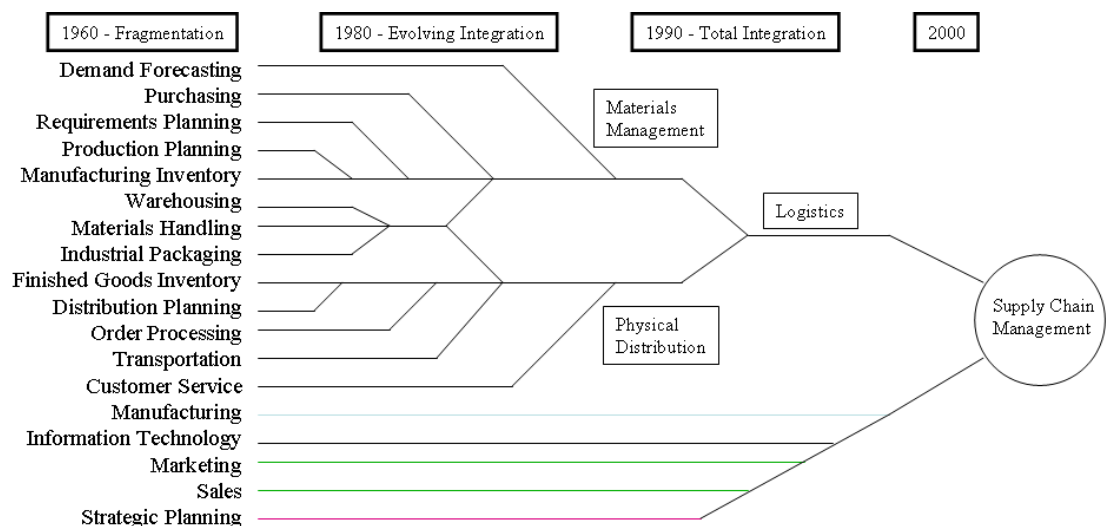


Figure 2.4: SCM Evolution  
Source: Battaglia (1994, p. 49)

Masters and Pohlen (1994) described the evolution of logistics management and the role of logistics managers in the following three phases:

1. Functional management (1960–1970) - functions such as purchasing, shipping and distribution are each managed separately;
2. Internal integration (1980s) - the management of the supply chain functions of a single facility is unified and it becomes the responsibility of a single individual; and,

3. External integration (1990s) - the management of supply chain functions throughout the chain is unified requiring cooperation and coordination between links in the chain.

La Londe (1994) also describes the evolution of integrated logistics in three phases:

1. Physical distribution - the distribution of goods is all that needs to be managed by a logistics manager;
2. Internal linkages - it is important for the logistics manager to control both internal supply functions and physical distribution; and,
3. External linkages - logistics management requires cooperation in management with upstream and downstream entities to maximise the benefits of the total logistics system.

The specific relationship between SCM and logistics will be discussed in sections 2.10 and 2.13.

### ***2.3.2 Lean/Functional to Agile/Customised Migratory Model***

Christopher and Towill (2000) used the personal computer (PC) supply chain to illustrate the migration from lean, functionally-oriented approaches to agile and more customised supply chain architectures. They use a model originally developed by Murokoshi (1994) to highlight the four main stages in this evolutionary process (see Table 2.1).

Supply chain evolution phase	I	II	III	IV
Supply chain time marker	Early 1980s	Late 1980s	Early 1990s	Late 1990s
Supply chain philosophy	Product driven	Market orientated	Market driven	Customer driven
SC type	Lean functional silos	Lean supply chain	Leagile supply chain	Customised leagile supply chain
Market winner	Quality	Cost	Availability	Lead time
Market qualifiers	(a) Cost (b) Availability (c) Lead time	(a) Availability (b) Lead time (c) Quality	(a) Lead time (b) Quality (c) Cost	(a) Quality (b) Cost (c) Availability
Performance metrics	(a) Stock turns (b) Production cost	(a) Throughput time (b) Physical cost	(a) Market share (b) Total cost	(a) Customer satisfaction (b) Value added

Table 2.1: Migration from Lean/Functional to Agile/Customised Supply Chains  
Source: Christopher and Towill (2000, p. 212)

As pointed out earlier, lean thinking has its origins in the Japanese automotive industry, in particular in the Toyota Production System (TPS) and the just in time (JIT) paradigm



(Ohno, 1988; Womack and Jones, 2003). The main objective of this thinking was the identification and elimination of non-value-adding activities (NVAs) or waste (or “muda” in Japanese). As noted earlier, an NVA may be defined as<sup>8</sup>: *any activity (or resource or asset) that adds cost (or time) to any supply chain process without adding value from a customer perspective*. In the early 1980s the focus was largely on cost optimisation through improved efficiency, particularly in manufacturing processes.

As customer service issues such as product availability and lead time evolved from being order (or market) qualifiers to becoming order (or market) winners, the need emerged for not just lean functions and supply chains, but for responsive and customer-oriented configurations. In other words, agility became a key concern. The agility concept is closely associated with Cranfield University in the UK and with Prof. Martin Christopher in particular (see, for example: Christopher, 2000; Christopher and Towill, 2001). Christopher (2000, p. 37) defines agility as “a business-wide capability that embraces organisational structures, information systems, logistics processes and, in particular, mindsets”. Flexibility, with its origins as a business concept in flexible manufacturing systems (FMS), is a key characteristic of an agile organisation. In essence, the need for a shift from lean to agile paradigms has been driven by dynamic and increasingly competitive global markets. The concept of mass customisation (MC) is a key driver of this shift.

The MC concept was first coined by Davis (1989) and it promotes the ability to provide individually designed products and services to every customer. This contrasts starkly with the Henry Ford Model T paradigm. It is achieved through high process agility, flexibility and integration (see, for example: Pine et al., 1993; Hart, 1995; Eastwood, 1996; Da Silveira et al., 2001). In short, as markets become more competitive and customers more discerning, there is a need to move towards the MC ideal, and supply chain agility is the route for making this happen. As Christopher (2000) notes, leanness may be an element of agility but it will not in itself provide the degree of organisational flexibility which is increasingly required to meet changing customer requirements<sup>9</sup>. More recently, Liu and Deitz (2011) found that MC capabilities are driven by customer-focused product design and reduced supplier lead times.

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<sup>8</sup> Author’s definition based on Jones et al. (1997), Goldrat and Cox (1992), Womack and Jones (2003) and others.

<sup>9</sup> He actually makes the point that an industry may be very lean but not be sufficiently flexible or ‘nimble’ to consistently meet customer requirements profitably. He suggests that the automotive industry might be a case in point.

A final element of the Christopher and Towill Migratory Model worthy of comment is the leagility concept. The desirability of being both lean and agile has resulted in the rather contrived term, “leagile”, being coined. A leagile supply chain is defined as one which combines elements of both the lean and agile approaches. In technical terms, leagility involves the strategic use of a decoupling point (Naylor et al., 1999). This decoupling point aims to achieve responsiveness to volatile demand downstream (i.e. in the market) while providing level scheduling upstream from the decoupling point. In essence, it is an attempt to get the best of both worlds.

### ***2.3.3 Lummus and Vokurka Historical Perspective***

Lummus and Vokurka (1999) suggested that the origins of SCM can be traced to the quick response (QR) programme in the textile industry and later to the efficient consumer response (ECR) programme in the grocery industry.

The origins of QR are often traced back to Blackburn (1991) and a useful definition is provided by Fisher and Raman (1996). In the specific context of the textile sector they describe QR as:

An initiative designed to cut manufacturing and distribution lead times through a variety of means including information technology such as electronic data interchange, point of sale scanners, and bar coding, logistics improvements such as automated warehousing and increased use of air freight, and improved manufacturing methods, ranging from laser fabric cutting to reorganisation of the sewing process into modular sewing cells (p. 87).

This definition recognises the central role of IT in the supply chain improvement process and that improving the speed of response to customer requirements demands a focus on both distribution and manufacturing issues. ECR originated from a grocery industry task force that was established in 1992 (Kurt Salmon Associates Inc., 1993) and focuses on the need for quick and accurate information flows in the supply chain as the key to supply/demand synchronisation and inventory reduction. The key common objective of QR and ECR is speed of response to customer requirements – both recognise this as an integral element of value creation. They also recognise the centrality of effective information management in the achievement of this objective.

Lummus and Vokurka (1999) go on to outline other early documented efforts at improving supply chain performance in companies across a range of sectors<sup>10</sup>. Their paper continues with a focus on collaborative efforts aimed at identifying “best practices” (for example, the SCOR model developed by the Supply Chain Council) and on the need for a clear linkage between SCM and overall corporate strategy. It concludes by suggesting seven guidelines for companies beginning to manage across the entire supply chain. All seven relate, directly or indirectly, to the need for supply chain companies to work in a more coordinated and collaborative way.

The Supply Chain Council (SCC) was established in 1996 and initially included 69 practitioner companies meeting in an informal consortium (Supply Chain Council, 2009). It had grown to approximately 800 members worldwide, across a range of sectors, by 2005. The Supply Chain Operations Reference (SCOR) model is a product of the SCC and “provides a unique framework that links business process, metrics, best practices and technology features into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management and related supply chain improvement activities” (Supply Chain Council, 2009). Three key features of the model are important (see Appendix 2):

1. It integrates the concepts of business process re-engineering (BPR), benchmarking and process measurement into an integrated framework.
2. It is based on five distinct management processes:
  - (i) Plan: Demand/supply planning and management.
  - (ii) Source: Sourcing stocked, make-to-order and engineer-to-order products.
  - (iii) Make: Make-to-stock, make-to-order and engineer-to-order production execution.
  - (iv) Deliver: Order, warehouse, transportation, and installation management for stocked, make-to-order and engineer-to-order product.
  - (v) Return: Return of raw materials and receipt of returns of finished goods.
3. It contains three levels of process detail:
  - (i) Top level: Process types.
  - (ii) Configuration level: Process categories.

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<sup>10</sup> Hewlett-Packard, Whirlpool, Wal-Mart, West Co., Becton Dickinson, Baxter and Georgia-Pacific Corp.

- (iii) Process element level: Based on process decomposition.

Since its first introduction, a number of papers have appeared in the academic literature concerning the SCOR model (for example: Stewart, 1997; Huan et al., 2004). In a recent paper based on data from 125 North American manufacturing firms, Zhou et al. (2011) stated that, “the findings provide managers with empirical evidence that the SCOR model is in fact valid” (p. 332).

#### ***2.3.4 Key Lessons from SCM Historical Evolution***

The three approaches to SCM historical evolution outlined above highlight at least four key elements of contemporary thinking in the field:

1. There is a need to focus clearly on customer service issues, in particular the speed of response to customer requirements;
2. Markets have become more sophisticated and customers more discerning – this has resulted in the need to understand the relevance of MC (as opposed to traditional “one size fits all” perspectives);
3. Intra-company integration of the constituent elements of supply chain functionality requires a strong management focus; and,
4. Effective information management, facilitated by recent developments in information and communications technology (ICT), is important in improving customer service performance.

Finally, the work of Gattorna et al. (2003), in particular the performance/capability continuum (see Figure 2.5), provides a useful conceptual overview which mirrors SCM historical evolution in many respects. Furthermore, most of the elements of contemporary SCM identified above are captured in this continuum. In particular, the shift from a focus on “function” to one on “collaboration” and “synchronisation” reflects the centrality of integration and effective information management in SCM thinking. The next section explores definitions of SCM in the literature with a view to synthesising the salient constituent elements of the field.

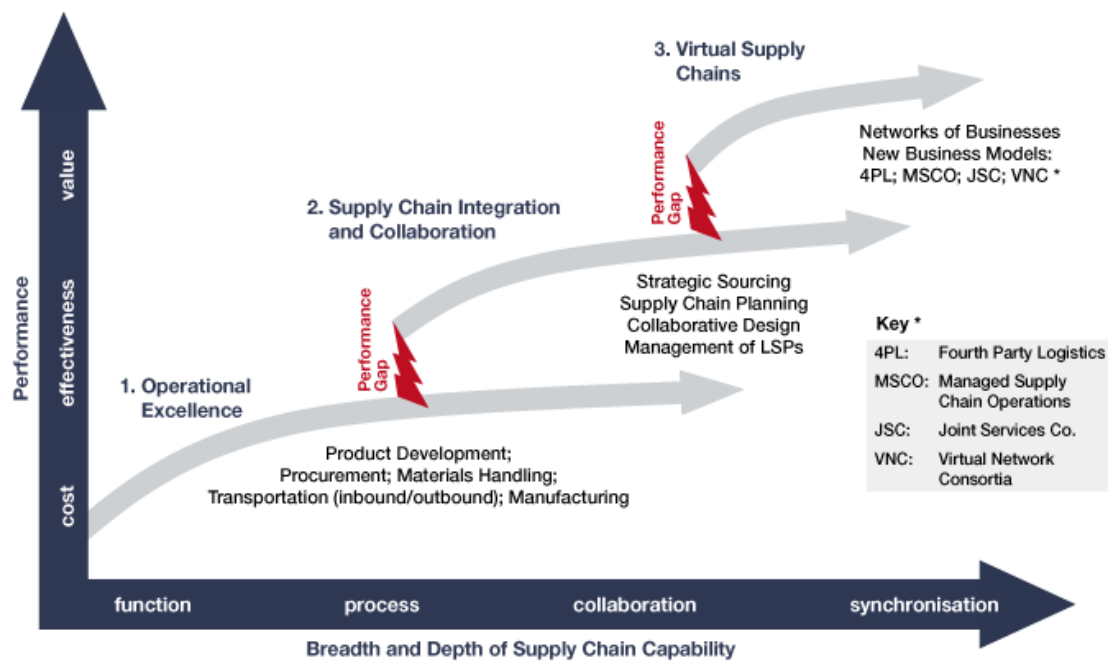


Figure 2.5: Performance/Capability Continuum  
Source: Gattorna et al. (2003, p. 47)

## 2.4 SCM Definitions

As noted earlier, a plethora of SCM definitions have been developed since the term was first introduced in the early 1980s. This section provides an overview of some of the important definitions and draws some conclusions from a synthesis of these definitions.

### 2.4.1 Defining SCM (Mentzer et al., 2001)

Mentzer et al. (2001) provide an excellent overview of the more important of these definitions (see Appendix 3) and, based on their analysis, provide a definition of their own.

From this representative sample of SCM definitions, Mentzer et al. (2001) suggested that three definition categories can be identified. Firstly, many authors define SCM as a *management philosophy*. In this context, SCM adopts a systems approach to viewing the supply chain as a whole, from the supplier to the ultimate customer. A chain-wide collaborative approach, driven by a strong customer focus, aims to synchronise intra-firm and inter-firm capabilities. Secondly, many authors consider SCM as a *set of activities to implement a management philosophy*. Seven activities are proposed, based on the earlier research, which appear necessary in the successful implementation of the philosophy:

1. Integrated behaviour in customer and supplier firms;
2. Mutually sharing information;
3. Mutually sharing risks and rewards;
4. Cooperation among supply chain members;
5. The same goal and the same focus on serving customers;
6. Integration of processes; and,
7. Partnerships to build and maintain long-term relationships.

Each of these activities relates to various aspects of inter-firm relationship management. Thirdly, Mentzer et al. (2001) note that many authors have focussed on SCM as a *set of management processes*. In this context, a process is defined as, “a specific ordering of work activities across time and place, with a beginning, an end, clearly defined inputs and outputs, and a structure for action” (p. 10). This is very much in line with business process reengineering (BPR) thinking, as championed by Michael Hammer (for example, Hammer and Champy, 1993). In essence, business processes take inputs and create outputs, and these outputs should be of value to a customer.

#### ***2.4.2 SCM: A Strategic Perspective (Bechtel and Jayaram, 1997)***

Bechtel and Jayaram (1997) presented a comprehensive review of definitions of both “supply chain” and “supply chain management” which appeared between the early 1980s and the mid 1990s. Based on this, they synthesised existing definitions into five “supply chain schools of thought”. Appendix 4 shows the scholars associated with each school, as well as graphical representations of the main tenets of each.

The schools of thought are:

1. Functional Chain Awareness School, which recognises that a chain of functional areas exists across an organisation;
2. Linkage/Logistics School, which goes beyond the chain awareness school by recognising that there is a chain from suppliers to end users and begins to address material flows through this chain;
3. Information School, which emphasises the flow of information between supply chain members;
4. Integration/Process School, which focuses on integrating supply chain areas into a system – defined as a set of processes – which adds value; and,
5. Future, based on “a demand driven seamless pipeline emphasising relations as well as transactions”.

The work of Bechtel and Jayaram (1997) in identifying these schools of thought provides some noteworthy insights into the essence of SCM. Firstly, there is a strong emphasis on the concept of integration and an associated emphasis on relational as opposed to purely transactional issues. They specifically note that “the SCM concept is becoming closely tied to the concepts of partnerships, strategic alliances, and other cooperative relationships with supply chain members” (p. 18). Secondly, they question the use of the word “supply” in SCM as it implies a traditional push orientation. As SCM is driven by an understanding of customer requirements, they suggest that “a better term might be ‘seamless demand pipeline’” (p. 18). There is a general recognition in the extant literature (see, for example: Christopher (2010); Kotzab et al. (2011); Lado et al. (2011)) that the primary focus of “supply” chains is on meeting the evolving needs of customers. Thus, whilst Bechtel and Jayaram (1997) may be accurate that “demand” is a more technically accurate word than “supply” in this context, there would appear to be little merit in attempting to replace a nomenclature that is by now – as pointed out in section 1.2 (above) – well established in both academic and commercial circles.

#### ***2.4.3 CSCMP Definition***

Founded in 1963, the Council of Supply Chain Management Professionals (CSCMP)<sup>11</sup> is a US-based association for individuals involved in SCM with over 10,000 members (CSCMP, 2009). It defines SCM as follows:

Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, SCM integrates supply and demand management within and across companies.

The phrase “logistics management” is incorporated into this definition. It defines this as: that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirements.

The specific emphasis on “reverse flows” is a recognition of the increasing importance of reverse logistics. In discussing boundaries and relationships, CSCMP goes on to state

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<sup>11</sup> CSCMP was known until 2005 as the Council of Logistics Management (CLM) and before that was known as the National Council of Physical Distribution Management (NCPDM) from its inception in 1963.

that SCM is an “integrating function”, which “drives coordination of processes and activities with and across marketing, sales, product design, finance and information technology”. The approach represented by this definition reiterates some of the earlier points and again has a strong emphasis on internal and external coordination and collaboration. However, the final part of the SCM definition – i.e., “In essence, SCM integrates supply and demand management within and across companies” – provides a useful conceptual view of SCM and is noteworthy for its simplicity, with its focus on synchronisation of supply and demand.

#### ***2.4.4 Key Lessons from SCM Definitions***

The three approaches to defining SCM outlined above highlight at least three key elements of contemporary thinking in the field, in addition to those identified based on the earlier synthesis of SCM’s historical evolution (section 2.3.4):

1. The very fact that many SCM definitions exist may, of itself, represent a limitation to developing a better understanding of the application of SCM in practice;
2. Effective management of relationships with external parties which perform key supply chain roles is a critical success factor; and,
3. The concept of reverse logistics, with its focus of supply chain activities after the point of sale, has become more important.

### **2.5 Paradigm Shifts**

As noted earlier, several authors have attempted to define SCM with reference to more traditional and conventional approaches to business management. This section sets out a number of these “paradigm shift” approaches in an effort to illustrate some of the key features of contemporary SCM.

#### ***2.5.1 Christopher’s Paradigm Shifts***

The work of Christopher was mentioned earlier in the context of supply chain agility (see section 2.3.2). His various papers provide another valuable insight into the nature of SCM (see, for example: Christopher and Ryals, 1999; Aitken et al., 2001; Christopher and Towill, 2002; Christopher and Peck, 2004). An important theme in his work is the move away from traditional approaches where companies viewed themselves as independent entities (or self-contained islands) to an apparently



paradoxical recognition that companies may have to cooperate to compete. This in turn requires a shift from traditional arms-length and often adversarial customer/supplier relationships towards relationships which are characterised by cooperation and trust. Arising from this thinking Christopher and Ryals (1999) stated that, “SCM encompasses both the internal management of the logistics processes that support the flow of product and related information, as well as the upstream and downstream linkages with suppliers and customers” (p. 3). This provides an insight into the concept of supply chain competition, with which Christopher is closely associated. He suggests that leading edge companies have realised the real competition is not company against company, but rather supply chain against supply chain (Christopher, 2005).

### ***2.5.2 Conventional Management and SCM (Storey et al., 2006)***

The work of Storey et al. (2006) provides close parallels to the paradigm shifts of Christopher. They refer to “an underpinning ‘big idea’ – or a number of interlocking big ideas which help constitute and describe SCM” (p. 758). Table 2.2 (below) represents an enumeration and categorisation of these core ideas. It shows clearly some of the key paradigm shifts between “conventional management” and SCM, thus elucidating the main constructs of SCM.

Dimension	Conventional management	Supply chain management
Unit of analysis, focal point of allegiance	Function, department, or firm as main unit of analysis	Supply pipeline as unit of analysis (materials flow planning; echelons; structures; value chain; network)
Use of information and knowledge	Information denial; lack of transparency	Information & knowledge sharing; transparency
Beneficiaries	One-sided benefit; win-lose	Mutual benefit; win-win
Targets	Optimisation; cost reduction; price central	Maximisation: Wider set of issues: value creation: quality, service, safety, etc.
Time horizons	Short-term wins; periodic negotiation	Long-term gains; life cycle (total value) costing
Relationship episode	Transactional	Longer term, deeper, multi-faceted relations
Range of “partners”	Multiple competitive sourcing	Single or reduced sourcing
Scope of task	Fragmented tasks; impermeable rigid boundaries; discrete activities	Interdependency; Co-makership; permeable flexible boundaries; overlapping activities
Connectivity	Independent logistics	Integrated logistics
Reactive vs proactive	Reactive buyers	Proactive buyers
Process of supplier selection	Competitive tendering	Total screening
Scope of attention	Role specific behaviour and knowledge	Expansive knowledgeable and behaviour
Replenishment device	Inventory	Information

Table 2.2: Conventional Management and SCM – core concepts  
Source: Storey et al. (2006, p. 759)

From this perspective, SCM adopts a more critical strategic role with a strong focus on long-term gains for companies upstream and downstream in the supply chain. There is a strong emphasis on information and knowledge sharing and on the concept of replacing inventory with information.

### 2.5.3 Supply Chain “Mega-Trends” (Bowersox et al., 2000)

The work of Bowersox et al. (2000), based on research carried out over many years into the SCM practices of global companies at Michigan State University, resulted in the identification of 10 “mega-trends which will revolutionize supply chain logistics” (p. 1). These reflect the shift from an industrial to an information technology driven society. These are listed in Table 2.3 (below).

<b>Industrial Society</b>	<b>Information Society</b>	<b>Rank<sup>1</sup></b>
Customer Service	Customer Relationship Management	5-6
Adversarial Relationships	Collaborative Relationships	2-3
Forecast	Endcast	3-4
Experience Strategy	Transition Strategy	3-4
Absolute Value	Relative Value	1-2
Functional Integration	Process Integration	4-5
Vertical Integration	Virtual Integration	4-5
Information Hoarding	Information Sharing	3-4
Training	Knowledge-based Learning	1-2
Management Accounting	Value-based Management	1-2

<sup>1</sup>In each of the categories, the authors offer an assessment of an average North American firm's realization of each mega-trend using a scale of 1 to 10, with 10 being total implementation and 1 representing no meaningful transition.

Table 2.3: Mega-trends in Supply Chain Logistics  
Source: Bowersox et al. (2000, p. 9)

The ideas incorporated in these trends again overlap with many of the concepts and constructs suggested by Christopher and by Storey et al. (2006). It is interesting to note that the authors' assessment of the extent to which these trends have been realised in North American firms is quite low. Just one of the trends (from customer service to customer relationship management) is assessed above 5 (using a 1-10 scale). Several of the trends (from absolute to relative value; from training to knowledge-based learning; and, from management accounting to value-based management) are rated as low as 1-2. Notwithstanding the subjective nature of these assessments, this indicates that there is much work to be done by firms in realising these trends in practice.

### 2.5.4 Key Lessons from Paradigm Shifts

The adoption of thinking captured in these paradigm shifts has the potential to have a profound impact on the nature of strategic thinking in companies of all kinds. It challenges the conventional wisdom upon which the majority of traditional approaches to strategic thinking and strategy formulation are based. However, the extent to which

this thinking has been adopted – or even is understood – in practice is unclear. As suggested by Christopher (1992), “leading edge” companies may well have adopted this thinking to varying degrees but there is a need to understand its role and impact in the wider business community.

## 2.6 Development of SCM Theory

### 2.6.1 Background

The work of Croom et al. (2000) in classifying SCM literature indicates clearly that there is a lack of a recognised underlying theory. They classified SCM literature using the primary methodology-orientation adopted (i.e. prescriptive or descriptive, and theoretical or empirical). Figure 2.6 summarises the results.

	PREScriptive	DESCRIPTIVE
THEORETICAL	6%	11%
EMPIRICAL	27%	56%

Figure 2.6: Framework for Literature Classification  
Source: Croom et al. (2000, p. 74)

What is clear from this analysis is that the majority of SCM literature is primarily empirical-descriptive. On the basis of this finding, the authors “argue that theoretical development is critical to the establishment and development of SCM study” (p. 75). New (1996) stated that “the new orthodox of SCM is in danger of collapsing into a discredited management fad unless a reliable conceptual basis is developed” (p. 20); Lambert et al. (1998) alluded to the need for building theory in the specific context of developing normative tools and methods of successful SCM practice; Chen and Paulraj (2004b) state that “our analysis confirms that the area is devoid of clear theory” (p. 150); Mentzer et al. (2004) note that, “much logistics literature and research has been considered largely managerial in nature and lacking a rigorous orientation toward theory development, testing, and application” (p. 606); Burgess et al. (2006) note that, “there appears to be little consensus on the conceptual and research methodological bases of SCM” (p. 703) and that, “for the field of SCM, the extent to which theories have been

developed appears to be slight” (p. 711); Storey et al. (2006) note that, “critiques of the discipline of SCM suggest that it is atheoretical” (p. 758).

It is interesting to note that the latter two articles appeared in a special issue of the *International Journal of Operations and Production Management* devoted to whether SCM was emerging as an academic discipline. In their editorial, Cousins et al. (2006) suggested that SCM is a “developing” discipline. Words such as “infancy” (Chen and Paulraj, 2004b), “embryonic” (Chen and Paulraj, 2004a) and “emerging” (Storey et al., 2006) are indicative of the perceived current situation in relation to SCM theory. However, as suggested by Skjoett-Larsen (1999) “nothing is more practical than a good theory” (p. 51). In a recent editorial in the *Journal of Business Logistics*, Fawcett and Waller (2011) elaborated on this when they stated that:

Our world is chaotic and dynamic. Good theory is needed to: (1) resolve the many pressing challenges that confront us daily; as well as to, (2) take advantage of the tremendous opportunities that continue to emerge with the advent of new technology, adjustments in government policy, and adaptations in social thought (p. 3).

### ***2.6.2 Theories of SCM and Logistics***

A number of authors have proposed theoretical models to address the challenges raised in section 2.6.1. For example (and as noted in section 2.1), Chen and Paulraj (2004b) proposed a theoretical framework for SCM research based on their comprehensive analysis of existing work in the field.

Mentzer et al (2004) adapted different elements of various “theories of the firm” in an attempt to better understand the strategic role of logistics. These “theories of the firm” include economic theories (neoclassical, market value and agency cost models) and behavioural theories (e.g., resource dependence model and comparative institutional theory). The tables from Mentzer et al. (2004) which summarise these theories are shown in Appendix 5. Theoretical propositions based upon their “unified theory of logistics” are also offered (see Appendix 5). However, the authors acknowledge that:

Although we have presented a unified theory of logistics based upon logistics capabilities, we do not claim the proposed theory is the only framework to understand and further study logistics. In fact, we offer the proposed unified theory as only one way of looking at the logistics discipline. Therefore, future

research is strongly encouraged to challenge and/or refine our view of logistics. In addition, how this theory of logistics fits into the larger area of supply chain management needs to be further explored (p. 622).

They further acknowledge that their theory represents “only a starting point in what we hope will be on-going development of a unified theory of logistics” (p. 622).

### **2.6.3 SCM and the Value Chain**

One well-known approach to strategic thinking and strategy formulation, based on the concept of the value chain, was introduced over a quarter of a century ago by Michael Porter (see, for example, Porter, 1985). The concept of the value chain is based on the process view of organisations, the idea of seeing a manufacturing (or service) organisation as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes and outputs involve the acquisition and consumption of resources, such as money, labour, materials, equipment, buildings, land, administration and management. How value chain activities are carried out determines costs and affects profits.

Most organisations engage in hundreds, even thousands, of activities in the process of converting inputs to outputs. These activities can be classified generally as either primary or support activities that all businesses must undertake in some form. According to Porter (1985), the *primary* activities are:

1. **Inbound Logistics**, which involve relationships with suppliers and include all the activities required to receive, store and disseminate inputs;
2. **Operations** are all the activities required to transform inputs into outputs (products and services);
3. **Outbound Logistics**, which involve relationships with customers and include all the activities required to collect, store and distribute the output;
4. **Marketing and Sales** are activities that inform buyers about products and services, induce buyers to purchase them and facilitate their purchase; and,
5. **Service** includes all the activities required to keep the product or service working effectively for the buyer after it is sold and delivered.

The *support* activities are procurement, human resource management (HRM), technological development and infrastructure. A graphical representation of Porter's value chain is shown in Figure 2.7.

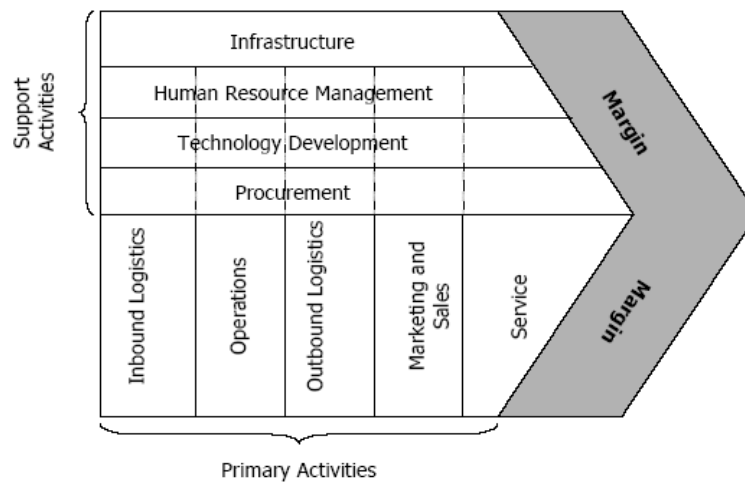


Figure 2.7: Porter's Value Chain  
Source: Based on Porter (1985)

Jacobs (2003, p. 62) notes that:

The value chain disaggregates a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation. A firm gains competitive advantage by performing these strategically important activities more cheaply or better than its competitors.

One implication of Porter's thesis is that firms need to examine each activity in their value chains to determine whether or not they have a real competitive advantage in the activity. One consequence of this is that activities which are not a source of real competitive advantage are often being outsourced (see section 2.2.3) thus creating more virtual supply chain architectures.

The relationship between the value chain and SCM has been the subject of discussion in several papers (for example: Barney, 1997; Lazzarini et al., 2001). As noted earlier, supply chains are sets of activities representing successive stages of value creation. The literature on SCM suggests that vertical interdependencies require a systemic approach to the management of material and information flows between firms engaged in the chain. On the other hand, Porter's original value chain analysis was primarily an approach that described a set of sequential activities creating value *within* firms<sup>12</sup>. However, outsourcing of supply chain functionality and the resulting creation of more virtual configurations has had the effect of extending the value chain beyond the boundaries of individual firms. As noted by Christopher (2005, p. 14), "the supply chain

<sup>12</sup> It is worth noting that attempts have been made to extend value chain analysis to activities between firms (for example Barney 1997).

becomes the value chain”. In other words, the distinction often traditionally espoused between the *value chain* and the *supply chain* has become inconsequential. As succinctly suggested by Christopher (2005, p. 14):

The effect of outsourcing is to extend the value chain beyond the boundaries of the business. Value (and cost) is created not just by the focal firm in a network, but by all the entities that connect to each other.

#### ***2.6.4 Relating SCM to Other Theories***

Many scholars have suggested that SCM could benefit by “borrowing from other theories” (Stock, 1997, p. 516). For example, Skjoett-Larsen (1999) studied SCM using three well established theoretical approaches: transaction cost analysis, network perspective and resource-based management. Halldorsson et al. (2007) built on this work by exploring the application of these three theories, as well as principal-agent theory, to the specific SCM research domains of third party logistics and new product development. Their work suggests that a single theoretical explanation can not be relied upon when analysing SCM phenomena:

Depending on the concrete situation, we can choose one theory as the dominant explanatory theory, and then complement with one or several of the other theoretical perspectives (p. 292).

They go on to conclude that “the main message in this paper is that there is no such thing as a ‘unified theory of SCM’” (p. 292).

In their recent paper, Defee et al. (2010) reported on their review of papers in five “top tier logistics and SCM journals”. Their work supports the view that the development of the SCM body of knowledge can benefit by viewing issues through the lenses afforded by other disciplines. Nonetheless, they point to the need for more SCM-specific theories when they note that:

The vast majority of theories used in recent logistics and SCM research originated in other disciplines. Growth in the discipline dictates the need for greater internal theory development (p. 404).

#### ***2.6.5 Some Concluding Comments***

While there is general agreement about the lack of theory in the field of SCM, there is little consensus about how this deficiency can be best addressed. However, definitional clarity would appear to be an issue upon which any meaningful development of SCM

theory needs to be predicated. Section 2.7 attempts to address this issue by proposing a *unified definition* (rather than a *unified theory*) of SCM. Before describing this definition, a number of points are worth highlighting.

Section 2.4.1 made reference to Mentzer et al. (2001). It is appropriate to revert to this work once again, in particular to the two constructs proposed by the authors. Firstly, they suggest that many definitions of SCM are trying to define two interdependent but different concepts in one term. The first is referred to as *supply chain orientation* (SCO) and is defined as “the recognition by an organisation of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain” (p. 11). However, SCM requires that SCO exists in several linked companies across a supply chain. In other words, SCO is a prerequisite for SCM. The work of Kotzab et al. (2006) reinforces this view based on a major survey of SCM implementation in Denmark by noting that “organisations seem to have insufficient SCO in order to direct their actions on business process integration with suppliers and customers.” (p. 293).

Secondly, the definition of SCM proposed by Mentzer et al. (2001, p. 18) based on their analysis of the literature is:

The systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.

This definition amalgamates a variety of concepts and philosophies into a single sentence. Its authors claim that their work “should help practitioners as well as researchers to understand SCM, to give guidance to what SCM is, its prerequisites, and its potential effects on business and supply chain performance” (p. 19).

## **2.7 Towards a Unified Definition of SCM: The *Four Fundamentals***

A number of points are critically important from the earlier sections of this chapter. Firstly, the very fact that many SCM definitions exist may, of itself, limit management’s understanding of the SCM concept and the practical effectiveness its application (as noted by, for example, Ross, 1998). Furthermore, a range of – often quite complex – SCM language and terminology has evolved over the years. Given that there are many



bodies of literature associated with SCM this should not come as a major surprise. Mentzer et al. (2001, p. 2-3) refer to “confusion”, “ambiguity” and “a need to examine the phenomena of SCM more closely to define the term and concept”; Lambert (2004) stated that there is a great deal of confusion regarding exactly what SCM involves; Croom et al. (2000, p. 68) note that despite the existence of SCM since the early 1980s, “conceptually the management of supply chains is not particularly well understood” and go on to highlight the necessity for clear definitional constructs; Burgess et al. (2006, p. 704) observe that, “For the term SCM there appears to be little consensus on its definition”; Kathawala and Abdou (2003, p. 141) conclude that SCM “has been poorly defined and there is a high degree of variability in people’s minds about what is meant”. Stock and Boyer (2009) summarise these points very well by stating that:

Without the adoption of a uniform agreed upon definition of supply chain management (SCM), researchers and practitioners will not be able to “advance the theory and practice” of the discipline. An integrated definition of SCM would greatly benefit researchers’ efforts to study the phenomenon of SCM and those practitioners attempting to implement SCM (p. 690).

Other scholars, including New and Payne (1995) and Saunders (1995) contend that there is a confusing profusion of overlapping terminologies and meanings. For example, Tan (2001, p. 41) noted that:

The literature is replete with buzzwords such as: integrated purchasing strategy, integrated logistics, supplier integration, buyer/supplier partnerships, supply base management, strategic supplier alliances, supply chain synchronization and supply chain management.

He went on to suggest that supply chain management is a “widely used (and abused) term” (p. 39). Croom et al. (2000) also note that many labels can be found referring to supply chain and to practices for SCM, including: integrated purchasing strategy, supplier integration, buyer/supplier partnership, supply base management, strategic supplier alliances, supply chain synchronisation, network supply chain, value-added chain, lean chain approach, supply pipeline management, supply network and value stream. Cousins et al. (2006) also note the use of terms such as pipeline management, network sourcing, demand management and value stream management.

Furthermore, many of the SCM definitions in the literature attempt to provide short (often single-sentence) definitions (see above, in particular: CSCMP, 2009; Mentzer et

al., 2001). In the author's view, the results are, almost inevitably, achievements in verbal and linguistic dexterity rather than definitions which are likely to add clarity from an SCM application perspective. Stock and Boyer (2009) provide a particularly interesting example of this phenomenon. They developed their own "consensus" definition of SCM based on 166 definitions that have appeared in the literature:

The management of a network of relationships within a firm and between interdependent organizations and business units consisting of material suppliers, purchasing, production facilities, logistics, marketing, and related systems that facilitate the forward and reverse flow of materials, services, finances and information from the original producer to final customer with the benefits of adding value, maximizing profitability through efficiencies, and achieving customer satisfaction (p. 706).

The author presents the *Four Fundamentals* in an attempt to concisely, yet comprehensively, define the essence of SCM. It is aimed primarily at a practitioner audience and aims to bring clarity and understanding to the issue. The avoidance of jargon and complex language is an element of this. It takes into account the guidance provided by New (1997):

On the one hand, too tight a definition of the supply chain concept artificially closes off productive avenues of development. On the other hand, too loose a definition allows the label to collapse into an amorphous study of everything (p. 16).

The *Four Fundamentals* seek to describe the main constituent elements of SCM, as well as positioning SCM in the overall corporate strategic framework. It is informed by the literature review as described in sections 2.2 – 2.6 (and as set out in Figure 2.2). Furthermore, it aims to provide a definition which is intelligible irrespective of the functional background, business sector or geographical location of the practitioner. Finally, the *Four Fundamentals* need to be relevant to supply chain professionals irrespective of their level of experience and/or seniority in industry. As shown in Figure 2.8, they relate to:

1. Setting SCM objectives;
2. SCM philosophy (based largely on the integration concept);
3. Managing supply chain flows; and,
4. Supply chain relationships.

<b><i>Fundamental One</i></b> <b><i>Fundamental Two</i></b> <b><i>Fundamental Three</i></b> <b><i>Fundamental Four</i></b>	<b>Setting SCM Objectives</b> <b>SCM Philosophy: Integration</b> <b>Managing Supply Chain Flows</b> <b>Supply Chain Relationships</b>
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Figure 2.8: The *Four Fundamentals* of SCM

The following sections describe each of the *Fundamentals* in turn.

## 2.8 *Fundamental One: Setting SCM Objectives*

Figure 2.9 (below) highlights the role of *Fundamental One* in the context of the wider construct.

<b><i>Fundamental One</i></b>	<b>Setting SCM Objectives</b>
<b><i>Fundamental Two</i></b>	<b>SCM Philosophy: Integration</b>
<b><i>Fundamental Three</i></b>	<b>Managing Supply Chain Flows</b>
<b><i>Fundamental Four</i></b>	<b>Supply Chain Relationships</b>

Figure 2.9: *Fundamental One* of SCM

### 2.8.1 *The Role of Objectives*

The concept of management by objectives (MBO) has been written about for many years (for example: Albrecht, 1979; Humble, 1971) and continues to attract attention (Aggarwala, 2002). The basic concept of MBO is that agreed objectives form the basis of the planning process. Setting objectives is of crucial importance for any planning activity and is central to the successful creation and implementation of any plan for several reasons, including the following:

- It focuses the attention of planners on the main targets to be achieved;
- It provides a sense of direction to those creating and implementing the plan; and,
- It provides a basis for post-hoc evaluation of the plan.

For these and other reasons, the creation of business objectives continues to play a key role in lexicon of management training and education (see, for example, Rouillard, 2002)<sup>13</sup>.

<sup>13</sup> Objective setting is often based on the **SMART** approach. Objectives should be **S**pecific, **M**easurable, **A**lligned, **R**ealistic and **T**ime-based.

From an SCM perspective, the key objectives are:

- To meet or exceed the required or demanded customer service levels in targeted markets/segments; and,
- To optimise total supply chain investment and cost.

This service/cost approach has long been regarded as central to SCM (Christopher, 1992)<sup>14</sup>.

### **2.8.2 Customer Service**

Customer service has long been recognised as an integral component of a firm's marketing strategy to increase sales and profits (Lambert, 1992; Lambert and Sterling, 1993). Furthermore (and as noted earlier), customer service is becoming a key source of differentiation or an order winning criterion in many sectors (Christopher, 2005). In many sectors the importance of customer service relative to product quality (now largely an order qualifier) and price (largely determined by the dynamics of supply and demand in the market and subject to downward pressure in many sectors) has increased (Sweeney, 2004). In other words, customer service has become a more critical element of the overall marketing mix of organisations.

The key to the role of customer service in SCM lies in: (i) understanding customers' needs and requirements in targeted markets/segments; and then, (ii) meeting (or exceeding) these needs. To support this, the concept of an external and internal audit has been suggested (Sterling and Lambert, 1989). The purpose of an external audit is primarily to understand customer expectations and competition service levels. An internal audit is used to assess the level of customer service provided and establish a benchmark against which changes in service can be appraised. In assessing prior research, Sterling and Lambert (1989) concluded that many of the past studies in this area narrowly defined customer service and failed to measure it from a customer's point of view. Similarly, the National Institute for Transport and Logistics (NITL, 2001, p. 1) noted that:

The first thing to ask is: 'What do we mean by customer service?'. To some organisations it means dealing with customer complaints; to others it is about after-sales service; and, to yet others it is the 'have a nice day' attitude to customers.

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<sup>14</sup> The title of this book *Logistics and Supply Chain Management: Strategies for Reducing Costs and Improving Service* reflects this.

They go on to suggest that in an SCM context customer service means “something quite specific and includes all the factors involved in supporting and getting product to customers” (NITL, 2001, p. 2). Table 2.4 shows the suggested constituent elements of customer service. Most of these overlap with the elements suggested by Grant (2004) based on the original work of LaLonde and Zinszer (1976).

Customer Service Elements
<ul style="list-style-type: none"> <li>• Product Availability (Can orders be filled)</li> <li>• Length of Order Cycle Time (Time it takes from order to delivery, usually counted in days)</li> <li>• Consistency of Order Cycle Time (Always the same length of time from order to delivery)</li> <li>• Invoice / Billing Procedures / Accuracy</li> <li>• Information Request Responsiveness (How fast does company respond)</li> <li>• Flexibility in Resolving Problems</li> <li>• Distance to Suppliers Warehouse</li> <li>• Special Customer Requests</li> <li>• Frequency of Damaged Goods (Do products get damaged on the way to the customer?)</li> <li>• Quality of Order Department</li> <li>• Emergency Coverage</li> <li>• On-time Delivery</li> </ul>

Table 2.4: Elements of Customer Service  
Source: NITL (2001)

These elements form the basis of both the external and the internal audit processes. Armed with the information yielded by these, companies can then develop market-driven customer service strategies, which “deliver the level of service customers actually want and are willing to pay for, and exploit company strengths and competitor weaknesses” (NITL, 2001, p.2).

Before concluding this overview of customer service in the supply chain, it is worth reiterating that increasing competition means that different market segments – and, indeed, different customers – will increasingly have different customer service requirements. This is in line with the MC concept discussed earlier. The original MC concept (Davis, 1989) promoted the ability to provide individually designed products to every customer. As customer service becomes a more critical order winning criterion, the need to customise service levels to meet the requirements of different markets and customers is likely to become more important. In an SCM context, therefore, the author

proposes an approach to MC which promotes *the ability to provide individually designed products, with individually incorporated service levels, to every customer*. In short, different customers may have different service requirements and these requirements are likely to change over time. The key challenge is to design supply chains which are sufficiently agile to meet these needs.

It is not just about *improving service* as the title of Christopher (1992) suggests. Rather the objective needs to be, as pointed out earlier: *to meet or exceed the required or demanded customer service level in targeted markets/segments*. This may result in a requirement to improve service but, as pointed out by NITL (2001) for example, “it is quite common to find companies incurring significant costs to provide a speedy response to customers ... customers often indicate that speed is not the issue”. In other words, companies may be over-servicing customers in certain ways (e.g. length of order cycle time), while failing to meet their needs in other, more critical, ways (e.g. consistency of order cycle time). The key is to recognise that understanding customer service requirements is the starting point in the supply chain design process. In other words, as shown in Figure 2.10, a market-driven customer service strategy – based on clearly understood customer requirements – sets the specification for integrated SCM. The title of the paper by Korpela et al. (2001), “Customer Service Based Design of the Supply Chain”, captures this approach very effectively.

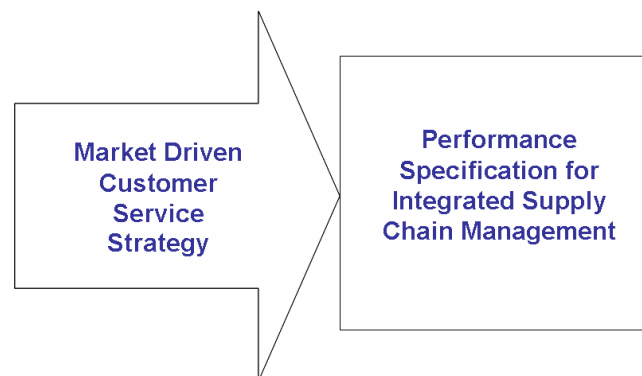


Figure 2.10: Customer Service in Integrated SCM Performance Specification  
Source: Modified from Sweeney (2004)

### **2.8.3 Total Supply Chain Investment and Costs**

As noted earlier, a significant amount of the cost base of companies is in the supply chain and a key objective is to optimise this (and all other) expenditure. The emphasis must be on *total* supply chain costs. The key issue is that a reduction in expenditure in one part of the supply chain (e.g. purchasing) may result in an increase elsewhere (e.g.

inventory holding costs). Godsell and van Hoek (2009) allude to a number of practices that are commonly used to improve discrete short-term measures of financial performance at the expense of the overall supply chain. In line with overall SCM philosophy it is important to take a supply chain wide view and to recognise the inevitable trade-offs that need to be addressed. The trade-off approach to supply chain costing has been a feature of the literature for many years (see, for example: Beckett, 1967; Schiff, 1972). Direct product profitability (DPP) represents an attempt to determine the costs of moving products through the entire supply chain. As the name suggests, DPP is essentially a technique for identifying the profit contribution of individual products by taking into account the specific supply chain costs incurred by particular items. As noted by Kurt Salmon Associates Inc. (1993) in the context of ECR in the grocery industry, the handling and storage costs attributable to specific products “had virtually wiped out” apparently high gross profits. However, traditional DPP models ignored overhead and administrative costs which resulted in inaccuracies in terms of determining real total costs. The development of activity-based costing (ABC) in the 1980s was an attempt to assign overhead costs more accurately within organisations (Cooper, 1988). However, as noted by LaLonde and Pohlen (1996): “Despite the advantages of ABC, the methodology does not provide a satisfactory solution to supply chain management” (p. 3). They note that the focus of ABC is on internal activities and go on to state that:

These internal applications provide valuable information; however, they do not enable the supply chain participants to determine where non-value-added activities may exist in the supply chain, what high cost activities or processes to target for continuous improvement or reengineering, what are the key factors driving supply chain costs, or how to incorporate the notion of functional shiftability – to strategically position logistics activities in the channel where the function can be best performed in terms of cost, time, or quality (p. 4).

More recent work on time-driven ABC (TDABC) – see, for example, Everaert et al. (2008) – adds another dimension to ABC by using time equations to estimate the time consumed by activities across the supply chain.

The total cost of ownership (TCO) approach addresses some of these weaknesses. As noted by Ellram (1995), this approach recognises that purchase price represents only a portion of the total cost of acquiring an item. It seeks to identify total acquisition price by including the costs of purchasing, stock holding, poor quality and delivery failure.

The previously cited paper by La Londe and Pohlen (1996) provides a useful supply chain costing model. The authors note that:

Supply chain costing provides a mechanism for developing cost-based performance measures for the activities comprising the key processes within the supply chain. The capabilities provided by supply chain costing include the ability to: determine the overall effectiveness of the supply chain, identify opportunities for further improvement or reengineering, measure performance of individual activities or processes, evaluate alternative supply chain structures or select supply chain partners, evaluate effects of technology improvements (p. 5).

The six-step methodology<sup>15</sup> incorporates elements of trade-off analysis, DPP and ABC. The work of Bastl et al. (2010) extends this logic beyond the boundaries of the internal supply chain by highlighting some of the limitations of current accounting practices in an inter-organisational (or external supply chain) context.

The foregoing relates to supply chain costs. Similar logic can be applied to the issue of investment in supply chain capability. In broad terms, such investment aims to improve service performance and/or reduce costs. As noted by New (1995) the expenditure involved can be significant and needs to be subject to the usual investment appraisal processes to assess its value to the firm. Blankey (2008) present a useful conceptual model of the financial gains associated with investment in supply chain management technology (SCMT). Their work suggests that such investment leads to “improvement in knowledge-intensive capabilities, which in turn lead to tangible operational or functional improvements” (p. 176).

Finally, it should be noted that the objective is not just about *reducing costs* as the title of the book by Christopher (1992) suggests. Rather the objective needs to be, as pointed out earlier: *to optimise total supply chain investment and cost*. For example, it may be necessary to commit investment to supply chain improvement and/or to increase operating costs to meet (or exceed) customer service requirements. In any case, it is important that total supply chain investment and cost is assessed as fully and as accurately as possible. An understanding of the current situation provides a key input to the supply chain design process. It could also be argued that the effectiveness of SCM

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<sup>15</sup> The steps are: analysing supply chain processes, breaking processes down into activities, identifying the resources required to perform an activity, costing the activities, tracing activity costs to supply chain outputs, and analysis and simulation.



implementation is assessed by measuring its impact on financial performance, as shown in Figure 2.11.

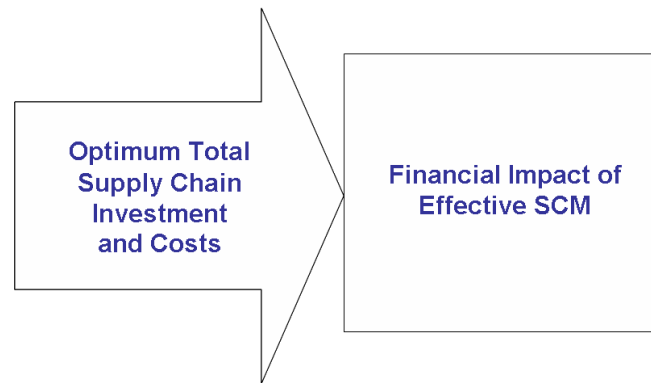


Figure 2.11: Improved Financial Performance Measures the Effectiveness of SCM  
Source: Modified from Faulkner (2002)

#### 2.8.4 The Service/Cost Conundrum

The foregoing raises the issue of how both customer service and financial improvements can be achieved simultaneously – i.e., the so-called *service/cost conundrum*. Conceptually, customer service improvements and cost reductions might appear to be mutually exclusive; that is, service improvements require investment in supply chain capability or increases in supply chain operating costs, and reductions in expenditure cause service levels to be reduced. As noted by Stevens (1989), the objective is to effect a balance between what are often seen as conflicting goals of high customer service, low inventories and low unit cost. Two simple equations (both cited in Christopher and Towill, 2000) provide a useful illustration of this issue.

1. Supply chain total PDP costs = Physical PDP costs + Marketability costs.  
PDP is *product delivery process*. “Physical costs” include all production, distribution and storage costs. “Marketability costs” include all obsolescence and stock-out costs (Fisher, 1997).
2. Total value = (Quality × Service level)/(Costs × Lead time)  
(Johansson et al., 1993).

The first equation indicates that costs associated with a failure to meet customer requirements are just as much a part of total cost as the, often more easily measurable, physical costs. To optimise total cost, therefore, customer service level demands need to be met and physical costs need to be optimised. As pointed out by Christopher and Towill (2000), the second equation is particularly helpful as it emphasises the futility of improving one performance measure at the expense of worsening another. Furthermore,

the equation re-introduces the concept of value. In the author's view this is the key to addressing the service/cost conundrum. The creation of value requires that all four elements in the equation are tackled simultaneously. One approach to this is based on the time-based SCM.

The concept of time compression in the supply chain is not new (see, for example: Stalk and Hout, 1990; Towill, 1996; Mason-Jones and Towill, 1998). Indeed, the JIT paradigm was based on the elimination of the seven forms of waste (or "muda"), one of which is specifically, "waste of time in waiting" (Ohno 1988). Stalk and Hout (1990) claimed that 95 per cent of the time consumed by business processes is wasted. Beesley (1996) stated that the work of Warwick Manufacturing Group (WMG) in the mid-1990s substantiates this figure in a UK context<sup>16</sup>. He goes further by pointing out that "in a total supply chain context, most UK examples are struggling to achieve one per cent value-adding time" (p. 301). The key is that supply chain time compression has the potential to improve several of the elements of customer service (see Table 2.4) whilst simultaneously reducing cost (on the basis that "time is money"). In this way the value creation process is significantly enhanced.

Finally, the work of Fugate et al. (2010) is instructive in the context of the service/cost conundrum. Their empirical research findings "contradict the traditionally assumed 'either-or' relationship between efficiency and effectiveness" and "indicate that pursuing one does not preclude pursuit of the other, but rather the performance dimensions perhaps reinforce each other" (p. 52).

### ***2.8.5 Fundamental One: Summary and Some Concluding Points***

*Fundamental One* recognises the importance of objectives and sets out clearly the two generic SCM objectives. Any attempt at improving supply chain capability needs to be based on improving performance in these two areas. Understanding customer requirements in the marketplace and current supply chain cost elements and drivers then becomes the starting point for the supply chain improvement/reengineering process. As shown in Figure 2.10, the development of a market-driven customer service strategy sets the specification for SCM. Improved financial performance measures the

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<sup>16</sup> Beesley (1996) notes that 'The Time Compression Programme (TCP) exists as a partnership between industrial and academic parties of the Warwick Manufacturing Group (WMG, part of the University of Warwick). The programme was launched as a club scheme within the [UK Department of Trade and Industry] DTI's Enterprise Initiative and is jointly funded by the DTI and industrial partners.' (p. 303)

effectiveness of SCM (see Figure 2.11). Figure 2.12 shows how achievement of the two objectives combines to create competitive advantage through integrated SCM.

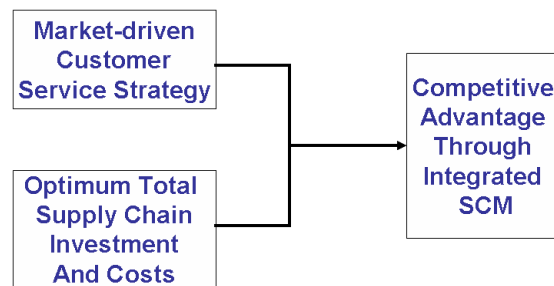


Figure 2.12: Achieving Competitive Advantage through Integrated SCM  
Source: Modified from Faulkner (2002)

Furthermore, it should be noted that there will inevitably be target markets (or segments or individual customers) which a company would like to service and where the cost of doing so provides the opportunity to capture profitable market share. Similarly, there will inevitably be others where the cost of doing so is prohibitive. This logic enables market segmentation and targeting to be based on “cost-to-serve” (Gebert et al., 1996) and “customer attractiveness” (Mortensen et al., 2008) models. The “margin-to-serve” (M2S) models that have been used in some sectors in recent years take this logic a stage further. Guerriero et al. (2008) suggest that such approaches – based on detailed and specific customer data – enable “a more comprehensive customer profitability analysis than the classical paradigm” (p. 389). In this way SCM, and the setting of clear SCM objectives specifically, becomes a key element of corporate marketing planning.

Finally, it is worth returning to the concept of value, which could be regarded as linking the cost/investment and customer service objectives. As noted by Lambert and Cooper (2000) “the objective of SCM is to create the most value, not simply for the company, but for the whole supply chain network including the end customer” (p. 82).

## **2.9 Fundamental Two: SCM Philosophy**

Figure 2.13 (below) highlights the role of *Fundamental Two* in the context of the wider construct.

<b><i>Fundamental One</i></b>	<b>Setting SCM Objectives</b>
<b><i>Fundamental Two</i></b>	<b>SCM Philosophy: Integration</b>
<b><i>Fundamental Three</i></b>	<b>Managing Supply Chain Flows</b>
<b><i>Fundamental Four</i></b>	<b>Supply Chain Relationships</b>

Figure 2.13: *Fundamental Two* of SCM

### 2.9.1 Supply Chain Integration

From the earlier discussion of both the historical evolution (section 2.3) and the definitions of SCM (section 2.4) it is evident that the concept of integration lies at the heart of SCM philosophy (see, for example: Christopher, 1992; New, 1996; Lambert, 2004). Cooper et al. (1997, p. 9) specifically describe SCM as “an integrative philosophy”. Storey et al. (2006) in their discussion of the interlocking ideas and propositions of SCM declare that, “the central underpinning ideas relate to alignment and integration” (p. 758). Perhaps most tellingly, Pagell (2004) declares that “in its essence the entire concept of SCM is really predicated on integration” (p. 460). If, as Mentzer et al. (2001) suggested, SCM can be regarded as a management philosophy then this philosophy is concerned first and foremost with integration. The widely cited work of Bowersox and his collaborators at Michigan State University (see, for example, Bowersox et al., 1999), which describes a framework of six competencies (the *Supply Chain 2000 Framework*) that lead to world class performance in logistics and SCM, supports this view. The six competencies<sup>17</sup>, grouped into three areas (operational, planning and relational) are all concerned with integration. A detailed schematic view of these competencies is shown in Appendix 6.

It should be recognised that the integration concept operates at a number of different levels. For example, the work of Fawcett and Magnan (2002) identified four levels of integration in practice:

1. Internal cross-functional integration;
2. Backward integration with valued first-tier suppliers;
3. Forward integration with valued first-tier customers; and,
4. Complete backward and forward integration (“from the supplier’s supplier to the customer’s customer”).

<sup>17</sup> Operational Integration: customer integration, internal integration, supplier integration; Planning Integration: technology and planning integration, measurement integration; Relational Integration.

Furthermore, and as noted earlier, Harland et al. (1999) classified research in this area according to the level of integration between supply chain activities. The four levels are:

1. Internal level, which considers only on those activities which are entirely internal to the focal company;
2. Dyadic level, which considers single two-party relationships (between, for example, supplier and manufacturer or manufacturer and distributor/retailer);
3. Chain level, which encompasses a set of dyadic relationships including a supplier, a supplier's supplier, a customer and a customer's customer; and,
4. Network level, which concerns a wider network of operations.

In each of these cases, the first level relates to integration of activities and processes which are carried out within a single organisation (i.e. *internal* or *micro-* or *intra-firm* supply chain integration). The others describe varying degrees of integration of activities which span the boundaries of organisations (i.e. *external* or *macro-* or *inter-firm* supply chain integration), with the last one of Fawcett and Magnan (2002) often being viewed as the theoretical ideal. The following sections discuss internal and external integration in more detail.

### **2.9.2 Internal Chain Integration**

The phrase “internal supply chain” has appeared in the literature (Huin et al., 2002) to describe worked aimed at breaking down the barriers between functions within organisations. To establish a framework for describing the key functions of a typical internal supply chain, New’s comment (1997, p. 17) that SCM “revolves around the buying, making, moving and selling of ‘stuff’” is quite instructive. It is in line with the “buy–make–move–sell” model of product supply chains (NITL, 2000) introduced earlier. For the purposes of this section the author has added a fifth element, namely the “store” activity. This has been done to ensure that all activities associated with the design and management of warehouses and other storage locations are given due recognition in the framework. Warehouse management has long been regarded as an integral element of the logistics activity of firms (see below) and a significant amount of specialist knowledge and expertise in this area has been developed over the years. Essentially, “move” has been disaggregated into separate “move” and “store” elements, reflecting the specific characteristics of each of these activities.

Most businesses – certainly manufacturing-based business – can be described in terms of the five functions: buy, make, store, move and sell. This is what is referred to as the internal (or micro- or intra-firm) supply chain as shown in Figure 2.14.



Figure 2.14: The Internal Supply Chain  
Source: Sweeney (2007, p. 50)

Traditionally these functions have often been measured, and therefore managed, in isolation, often working at cross purposes. As succinctly noted by Storey et al. (2006) this traditional approach is analogous to a relay race with responsibility being passed from one function to another. SCM means thinking beyond the established boundaries, strengthening the linkages between the functions, and finding ways for them to pull together. A recognition that the “whole is greater than the sum of the parts” calls for more effective integration between purchasing and procurement (buy), production planning and control (make), warehouse management (store), transport management (move) and customer relationship management (sell), as illustrated in Figure 2.15.



Figure 2.15: Integrating the Internal Supply Chain  
Source: Sweeney (2007, p. 50)

This shift, away from a functional orientation towards a more company-wide focus, is in line with the early stages of the various models of SCM historical evolution introduced in section 2.3. It is also analogous to the SCO approach of Mentzer et al. (2001) in the sense that SCO at firm level, as manifested in high levels of internal integration, could be regarded as a prerequisite for SCM, as manifested in high levels of external integration (see section 2.9.3). van Hoek et al. (2008) also recognise this phenomenon:

Deficient interaction between logistics and peer functions has serious implications within and beyond the firm as research strongly suggests that internal alignment is an important antecedent to alignment between supply chain partners (p. 110).

Nonetheless, the desirability of achieving seamless integration is not something which is unique to SCM. Organisations have long realised the need for company-wide approaches to organisational design and redesign. The development of systems engineering approaches to manufacturing system redesign in the 1970s and 1980s (see, for example Hitomi, 1996) was followed by the focus on organisational re-engineering, often based on business processes, in the 1980s and 1990s (Hammer and Champy, 1993). A common feature of these approaches was a recognition that “the whole is greater than the sum of the parts”. In other words, optimising subsystems (whether those subsystems are functional departments, production sites or individual processes in the manufacturing cycle) can result in a sub-optimised total system. Lack of efficiency and/or effectiveness is often a result of the poorly designed interfaces between subsystems rather than any inherent subsystem weaknesses. There are numerous examples of companies which have generated significant improvements in competitive advantage as a result of the application of this “total systems” thinking (see, for example: Checkland and Scholes, 1999<sup>18</sup>; Sweeney, 1999).

Finally, elements of two earlier SCM definitions highlight some of the key organisational issues associated with internal integration. Monczka et al. (1998) noted that SCM adoption requires traditionally separate materials functions to report to a manager with overall responsibility for coordination of the entire materials process. In a similar vein, Houlihan (1988) suggested that in an SCM environment, responsibility for the various components of the supply chain should not be fragmented and relegated to functional areas (e.g. manufacturing, purchasing, distribution and sales). However, a study by Ellinger (2002) recognises that despite its well documented advantages the extent of internal integration is limited. His study, which focussed specifically on integration between logistics and marketing functions, concludes that “marketing/logistics interdepartmental relations are only moderately effective” (p. 93).

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<sup>18</sup> Peter Checkland is particularly associated with ‘Soft Systems Methodology’ (SSM).

### 2.9.3 External Chain Integration

Every product or service is delivered to the final consumer (the only source of “real” money in the chain) through a series of often complex movements between companies which comprise the complete chain. An inefficiency anywhere in the chain will result in the chain as a whole failing to achieve its true competitive potential. In other words, supply chains are increasingly competing with other supply chains rather than, in the more traditional axiom, companies simply competing with other companies. Vachon et al. (2009) capture this concept very effectively by stating that “organizations are competing not only with their internal capabilities but also on their abilities to leverage capabilities in the supply chain” (p. 322). In this context, the phrase “supply chain” is used to indicate that the chain is only as strong as its weakest link. Lambert et al. (1998) suggested that “much friction, and thus waste of valuable resources results when supply chains are not integrated, appropriately streamlined and managed”. (p. 14). This concept of inter-company “friction” is useful in conceptualising the need to replace fragmentation with integration.

The simplistic representation in Figure 2.16 of the external (or macro- or inter-firm) supply chain shows materials flowing from the raw material source through the various stages in the chain to the final consumer. Money (i.e. funds) then flows back down the chain. The point is that every link matters and that value is added, and profit generated, at each link along the way.

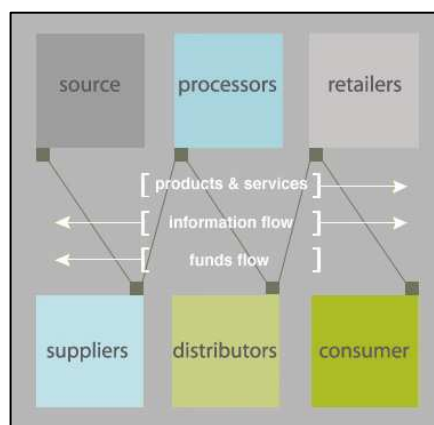


Figure 2.16: The External Supply Chain  
Source: Sweeney (2007, p. 52)

This aspect of *Fundamental Two* is central to most of the definitions of SCM introduced earlier. As Houlihan (1988) notes, the supply chain is viewed as a single (i.e. integrated) process. In other words, the various links in the chain need to function



in as seamless a manner as possible. Monczka et al. (1998, p. 78) refer to the use of “a total systems perspective across multiple functions and multiple tiers of suppliers”. The reference to “multiple functions” alludes to internal integration; extending this to “multiple tiers of suppliers” introduces the external integration concept, albeit in the rather limited sense of backward integration with suppliers. As noted earlier, the theoretical ideal is complete backward and forward integration (“from the supplier’s supplier to the customer’s customer”).

It is important to note that the representation in Figure 2.16 corresponds to the “chain level” in the classification of Harland (1996). In reality most “chains” are more like the “network level” with multiple suppliers and customers across the various tiers in the “chain”. Lambert et al. (1999) made reference to:

- Horizontal structure – this refers to the number of tiers across the supply chain;
- Vertical structure – this refers to the number of suppliers/customers represented within each tier; and,
- Horizontal position – this refers to where the focal company is positioned within the chain (e.g. close to the initial source of supply or nearer to the ultimate customer).

Thus, most “supply chains” are in reality three dimensional networks of organisations. In view of this, Lambert and Cooper (2000) suggest that “the ultimate success of the single business will depend on management’s ability to integrate the company’s intricate network of business relationships” (p. 65). Walters (2008, p. 724) puts this starkly by stating that:

It is unlikely that the “good old days” – if that is what they were – will return. The realistic organisation is one that will adapt to the new order of business relationships and seek to form network alliances and partnerships within and out with national boundaries.

It was noted earlier that “complete backward and forward integration” as postulated by Fawcett and Magnan (2002) might be viewed as the theoretical ideal. However, in reality various degrees of integration between upstream and downstream organisations will exist. In this context, Frohlich and Westbrook (2001) proposed the concept of “arcs of integration” (see Figure 2.17).

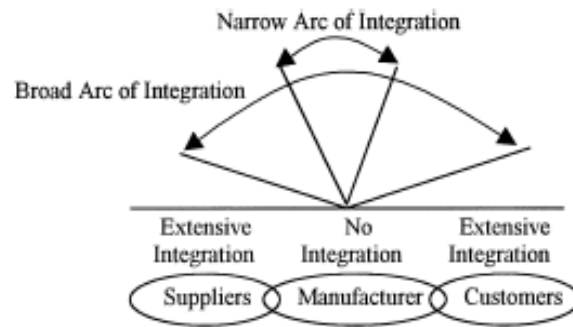


Figure 2.17: Arcs of Integration  
Source: Frohlich and Westbrook (2001, p. 187)

The direction of the segment refers to the direction of integration (i.e. upstream or downstream) while the degree of the arc indicates the level or extent of integration (from “no integration” to “extensive integration”). Similarly, Bask and Juga (2001) proposed the concept of “semi-integrated” supply chains. They suggest that “a fully integrated supply chain sounds impressive but says little” (p. 150). By way of illustration they note that:

The relationships between organisations are subtle and complex and no one recipe exists on how the supply chains achieve best performance. For some companies, tight integration is the answer under regimes like efficient consumer response, quick response, etc. For others, intensive integration may be the goal in selected areas of SCM, while in other areas it can be beneficial to strive for limited integration. Simultaneous properties of tight and loose control are needed as is suggested in the notion of semi-integrated supply chains (p. 149).

The work of Fabbe-Costes and Jahre (2007) is in line with this concept. They identify a “differentiated” approach to supply chain integration which “can help companies to identify and then to focus on a limited number of integration factors” (p. 847).

#### **2.9.4 Performance Measurement**

It was noted earlier that traditionally supply chain activities have often been measured, and therefore managed, in isolation. The contention implicit in this statement is that fragmented approaches to measurement result in fragmented approaches to management. This is line with the “what gets measured gets done” axiom. In relation to internal integration, Ellinger (2002) reinforces this point by contending that:

If functions are very interdependent in their work, it is counterproductive to base evaluation and reward systems on individual performance. The nature of such work demands compatible systems such as team-based pay and compensation,

performance appraisal and accountability at the team level, and recognition for team results (p. 87).

One of the case companies studied by Storey et al. (2006) provides a good illustration of this point in relation to external integration. The company in question had measures in place that showed that they consistently achieved their three-day delivery target. However, the large majority of orders were delivered after the date the customer had originally requested and on average they were 16 days late. The problem was that only that part of the supply chain over which they had control was being measured. As Brewer and Speh (2000) noted, performance metrics “are not always focused on measuring, motivating, and optimising inter-firm and intra-firm performance” (p. 82). Gunasekaran et al. (2004) captured the challenge very effectively by noting that:

Many companies have not succeeded in maximizing their supply chain’s potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain to maximize effectiveness and efficiency (p. 335).

Business performance measurement systems (PMS) generally, and supply chain performance measurement specifically, are subjects which have been the subject of extensive discussion in the literature for many years. The amount of work in the area of supply chain performance measurement specifically is illustrated by Fabbe-Costes and Jahre (2007) who note that a search in EBSCO-Business Source Complete identified over 700 peer-reviewed articles with a combination of “performance” and “supply chain management” in the title, abstract and/or keywords. Morgan (2007) provides a useful overview of the historical development of supply chain performance measurement (see Figure 2.18).

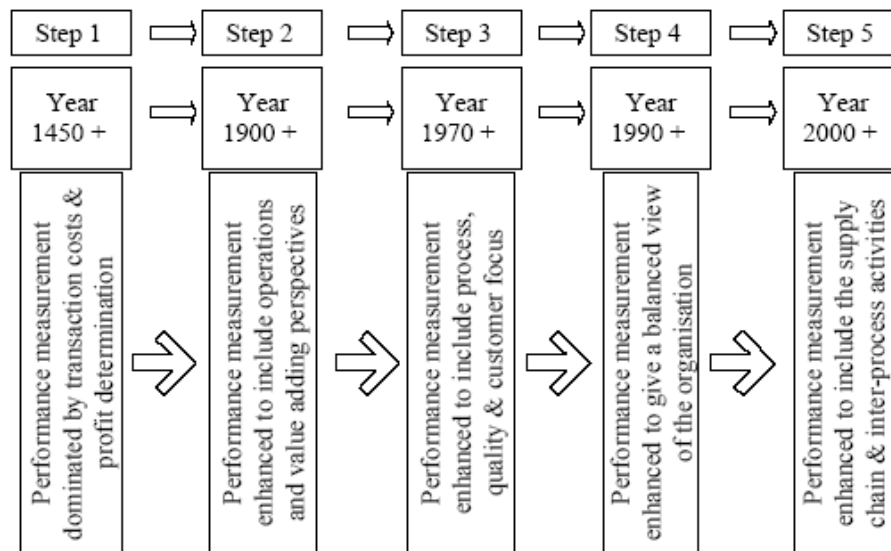


Figure 2.18: Phases of Development of Supply Chain Performance Measurement  
Source: Morgan (2007, p. 525)

The general trend over time has involved a shift away from the use of purely financial metrics with the importance of the supply network emerging in the final and current phase. This recognises that customer satisfaction can only come from the supply chain functioning effectively in totality (both processes and process interfaces).

Several authors have pointed out some of the challenges associated with effective supply chain performance measurement and some of the weaknesses inherent in current approaches. Chow et al. (1994) discuss how logistics performance has been and could be conceptualised. van Hoek (1998) suggested that vertical disintegration has resulted in a new scenario as much of a firm's competitive capability is no longer under its direct operational control. Beamon (1999) noted that "current supply chain performance measurement systems are inadequate because they rely heavily on the use of cost as a primary (if not sole) measure" (p. 280). Gunasekaran et al. (2001) noted the lack of a "balanced approach" and the lack of a "clear distinction between metrics at strategic, tactical and operational levels" (p.72). Lambert and Pohlen (2001) suggested that "in most companies, the metrics that management refer to as supply chain metrics are primarily internally focused logistics measures" and that "these metrics do not capture how the overall supply chain has performed" (p. 1). In the context of the wider external supply chain (or extended enterprise), Lehtinen and Ahola (2010) point out that "the main shortcomings of the PMS were related to a lack of external measures, especially those that focus on suppliers, and insufficient integration at the extended enterprise level" (p. 196).

In 1994, Caplice and Sheffi (1994) presented a taxonomy of logistics performance metrics, organized by process rather than by function, with the metrics evaluated using established criteria. Since then, a number of frameworks have been proposed which aim to address fragmentation in supply chain performance measurement, as well as some of the other weaknesses noted above. Three such approaches provide some useful foundations for effective measurement in a SCM context.

#### Balanced Scorecard

Brewer and Speh (2000) demonstrated how the balanced scorecard (BSC) framework developed originally by Kaplan and Norton (1996) could be adopted in a SCM context. The balanced scorecard is an attempt to balance the inclination to overemphasise purely cost and other financial metrics with measures related to other drivers of long-term profitability. It does this by using customer satisfaction, innovation and learning and business process metrics, along with purely financial metrics. Brewer and Speh (2000) propose that the supply chain perspective can be embedded within the internal business process dimension of the scorecard through the use of both “integrated” and “non-integrated” measures. They cite cash-to-cash cycle time as an example of the former in that it embraces several functions across several organisations. The latter, in contrast, provide diagnostics on where problems are occurring within individual functions and firms. Zimmermann and Seuring (2008) extend this thinking to the wider external supply chain in their discussion of the use of the BSC in an inter-organisational context based on two case studies.

#### Lambert and Pohlen Framework

Lambert and Pohlen (2001) proposed a framework that aligns performance at each dyadic link (i.e. supplier-customer pair) within the supply chain. The framework begins with the linkages at the focal company and moves outward a link at a time. The link-by-link approach provides a means for aligning performance downstream and upstream “with the overall objective of maximizing shareholder value for the total supply chain as well as for each company” (p. 8). The framework comprises seven steps:

1. Map the supply chain from point-of-origin to point-of-consumption to identify where key linkages exist;

2. Use the customer relationship management (CRM) and supplier relationship management (SRM) processes to analyse each link (customer-supplier pair) and determine where additional value can be created for the supply chain;
3. Develop customer and supplier profit and loss (P&L) statements to assess the effect of the relationship on profitability and shareholder value of the two firms;
4. Realign supply chain processes and activities to achieve performance objectives;
5. Establish non-financial performance measures that align individual behaviour with supply chain process objectives and financial goals;
6. Compare shareholder value and market capitalisation across firms with supply chain objectives and revise process and performance measures as necessary; and,
7. Replicate steps at each link in the supply chain.

This framework represents a methodology for overall supply chain improvement with a novel approach to performance measurement at its core.

#### Gunasekaran et al. Framework

Gunasekaran et al. (2004) proposed a measurement framework by considering strategic, tactical and operational measures for the four supply chain activities/processes of plan, source, make/assemble and deliver. An overview of the framework is shown in Figure 2.19 (below). The authors suggest that this framework provides “a starting point for an assessment of the need for supply chain performance measurement” (p. 344). In other words, the framework does not provide a usable tool but rather provides a foundation which can be developed and built upon.

Finally, Beamon (1999) presents four characteristics of effective performance measurement systems. Systems should be: inclusive (i.e. measure all pertinent aspects); universal (i.e. allow for comparison under various operating conditions); measurable (i.e. data is available); and, consistent (i.e. measures used should reflect organisational goals).

<u>Supply chain activity/process</u>	<u>Strategic</u>	<u>Tactical</u>	<u>Operational</u>
<b>Plan</b>	Level of customer perceived value of product, Variance against budget, Order lead time, Information processing cost, etc.	Customer query time, Product development cycle time, Accuracy of forecasting techniques, Planning of process cycle time, etc.	Order entry methods, Human resource productivity
<b>Source</b>		Supplier delivery performance, Supplier lead time against industry norm, Efficiency of cash flow method, etc.	Efficiency of purchase order cycle time, Supplier pricing against market
<b>Make/Assemble</b>	Range of products and services	Percentage of defects, Cost per operation hour, Capacity utilisation, Utilisation of economic order quantity	Percentage of defects, Cost per operation hour, Human resource productivity index
<b>Deliver</b>	Flexibility of service system to meet customer needs, Effectiveness of enterprise distribution planning schedule	Flexibility of service system to meet customer needs, Effectiveness of enterprise distribution planning schedule, Delivery reliability performance, etc.	Quality of delivered goods, On-time delivery of goods, Effectiveness of delivery invoice methods, Number of faultless delivery notes invoiced, etc.

Figure 2.19: Supply Chain Performance Metrics Framework  
Source: Modified from Gunasekaran et al. (2004)

### ***2.9.5 Fundamental Two: Summary and Some Concluding Points***

Virtually all contemporary definitions of SCM place a strong emphasis on the need for a shift from traditional supply chain architectures, which were often characterised by fragmentation, to more effective configurations, which need to replace fragmentation with integration. This is true both in relation to internal and external chains. *Fundamental Two* recognises this fact. The achievement of high levels of integration has implications for the design of organisational structures and supply chain architectures. Kemppainen and Vepsalainen (2003) suggest that in the future this is “expected to result in a new structure of demand-supply networks, in this paper called the encapsulated network, with shared technology and systems, extended decision rights and non-territorial services” (p. 716). There is evidence to suggest that higher levels of SCI positively impact on performance. For example, Elmuti et al. (2008) conclude that the results of their longitudinal study in the US:

show positive and substantial improvements in overall performance as a result of integration and coordination of the internal functions within the firm and effectively linking them with their external suppliers (p. 151).

As noted earlier, “leading edge” companies may well have adopted this philosophy to varying degrees but there is a need to understand its role and impact in the wider business community. For example, the recent work of Fabbe-Costes and Jahre (2008) concludes that:

In going behind the rhetoric of ‘integration is always best’, we have shown that ‘evidence’ cannot be taken for granted and that much more research is needed in particular with regard to the impact of extended inter-organisational SCI on supply chain performance (p. 145).

Finally, moving from fragmented to more integrated approaches inevitably requires changes to the ways in which both internal and external customer and supplier relationships are created and managed (see *Fundamental Four*). For example, the empirical work of Forslund and Jonsson (2009) in a Swedish context suggests that issues such as lack of trust and poor communication structures can act as obstacles to effective inter-firm integration.

## 2.10 *Fundamental Three: Managing the Flows*

Figure 2.20 (below) highlights the role of *Fundamental Three* in the context of the wider construct.

<b><i>Fundamental One</i></b>	Setting SCM Objectives
<b><i>Fundamental Two</i></b>	SCM Philosophy: Integration
<b><i>Fundamental Three</i></b>	<b>Managing Supply Chain Flows</b>
<b><i>Fundamental Four</i></b>	Supply Chain Relationships

Figure 2.20: *Fundamental Three* of SCM

### 2.10.1 *Supply Chain Flows*

Forrester’s pioneering article from over half a century ago (Forrester, 1958) established a specific link between corporate success and the interactions between five flow systems:

- Information;
- Materials;
- Money;
- Manpower; and,
- Capital equipment.

Since then, the concept of different flows interacting with each other, and the need to proactively manage these flows, is a theme which has been the subject of much research and discussion. In the 1980s, for example, Jones and Riley (1985) stated that “SCM is concerned with the total flow of materials from suppliers through end users” and



Stevens (1989) suggested that the objective of SCM is “to synchronise the requirements of the customer with the flow of materials from suppliers”. More recently, Christopher and Ryals (1999, p. 6) emphasised the importance of managing “the flow of product and related information”. In essence, for a supply chain to achieve its maximum level of effectiveness and efficiency, material flows, money flows and information flows throughout the entire chain must be managed in an integrated and holistic manner, driven by the overall service and financial objectives.

It is worth noting that Forrester (1958) alluded to five flows (manpower and capital equipment being the additional two). Croom et al. (2000) also referred to five flows (knowledge and technology being the additional two). In a sense, knowledge flow could be regarded as the 21<sup>st</sup> Century incarnation of manpower flows (knowledge flow being a consequence of interaction between people) and technology flow the 21<sup>st</sup> Century incarnation of capital equipment flows. In the context of defining the essence of SCM, however, the exchanges that are focussed upon are the material, money and information flows, as these are viewed as being the critical elements of supply chain operations planning and control.

The view of an external chain shown in Figure 2.16 indicates the way in which material, money (funds) and information flow between the companies which participate in the chain. Similar flows typically occur between the functions which comprise the internal chain. The following sections provide an overview of some of the issues involved in managing these material, money and information flows.

### ***2.10.2 Managing Material Flows***

Figure 2.16 shows the flow of material (“products and services”) from the source of materials forward (or upstream) to the final consumer in the external chain. It should be noted that there is also a backward (or downstream) flow of materials, traditionally associated with product returns but increasingly with recycling, packaging and end-of-life products. The growing importance of reverse logistics in recent years has sharpened the focus on management of these flows. For example, “Return” is the process most recently incorporated into the SCOR model (Supply Chain Council, 2009).

Much SCM theory has its origins in the well-established field of materials management. The evolution of materials management in many ways mirrors the evolution of SCM as

a whole. For example, the focus on manufacturing inventory reduction in the 1960s and 1970s (see Figure 2.4) became an integral part of the broader field of materials management in the 1980s and early 1990s (Battaglia, 1994). The need for more integrated approaches to materials management across the supply chain became a strong focus in the 1990s (see, for example, Hines, 1993). It could be argued that the whole field of logistics, with its origins in a military context, is fundamentally concerned with the efficient and effective management of the flow of materials through supply chains.

A common feature of definitions of logistics (such as that of the CSCMP (2009) – see section 2.4.3) is that they focus primarily on the management of material flows within a supply chain. Furthermore, they tend to regard logistics as one component element of the broader field of SCM. However, whilst this might be the most common approach to defining logistics and relating it to SCM, it is worth noting that there are a number of different schools of thought. As noted by Lummus et al. (2001, p. 427), “What is not always clear is how logistics differs from ... supply chain management”. Similarly, Larson and Halldorsson (2004, p. 18) point out that, “there is lack of agreement on how SCM is related to logistics”.

Larson and Halldorsson (2004) identify four conceptual perspectives on SCM versus logistics:

1. Traditionalist;
2. Re-labelling;
3. Unionist; and,
4. Intersectionist.

Their schematic representation of the perspectives contained in their paper is shown in Figure 2.21. The *traditionalist* school positions SCM in logistics: that is, SCM is just one small part of logistics. The *re-labelling* perspective simply renames logistics: what was logistics is now SCM!

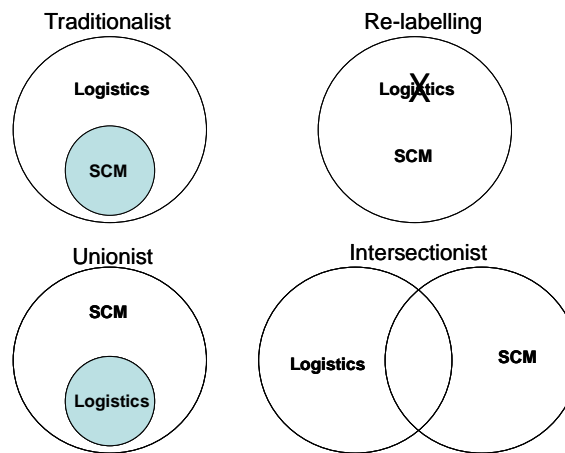


Figure 2.21: Perspectives on SCM versus Logistics  
Source: Larson and Halldorsson (2004, p. 19)

The unionist perspective treats logistics as a part of SCM: SCM completely subsumes logistics. Finally, the intersectionist perspective is described as follows by Larson and Halldorsson (2004, p. 21):

The intersection concept suggests SCM is not the union of logistics, marketing, operations management, purchasing and other functional areas. Rather, it includes strategic, integrative elements from all of these disciplines. For instance, in the purchasing area, negotiating a long-term arrangement is a strategic element and transmitting a purchase order is tactical. The supply chain manager would be involved in the negotiations, but not the purchase order transmission. Similarly, in the logistics area, hiring a third-party logistics (3PL) provider is a strategic decision, while picking and packing in the warehouse are tactical. At the intersection, SCM co-ordinates crossfunctional efforts across multiple firms. SCM is strategic, not tactical.

Whilst each of these approaches is valid in its own way, the research of Larson and Halldorsson (2004) indicates that the unionist view is the most widely adopted by scholars. The empirical evidence of Lummus et al. (2001) suggests a similar perspective amongst practitioners. Based on a small sample of manufacturers, retailers and 3PLs they conclude that:

Logistics is generally viewed as within one company, although it manages flows between the company and its suppliers and customers. Supply chain management includes the logistical flows, the customer order management and production processes and the information flows necessary to monitor all the activities at the supply chain nodes (p. 431).

In any event, ensuring that the right materials are in the right part of the supply chain at the right time remains an integral element of the SCM field.

### 2.10.3 Managing Money Flows

In a supply chain, money flows from the ultimate consumer of the product back down through the chain. The timing of these flows is critical to ensuring that supply chain companies maintain the ability to meet their ongoing operational expenditure commitments. The working capital cycle – a well-known construct in the field of financial management (see, for example, Keown et al., 2004) – provides a useful representation of financial flows in a supply chain (see Figure 2.22).

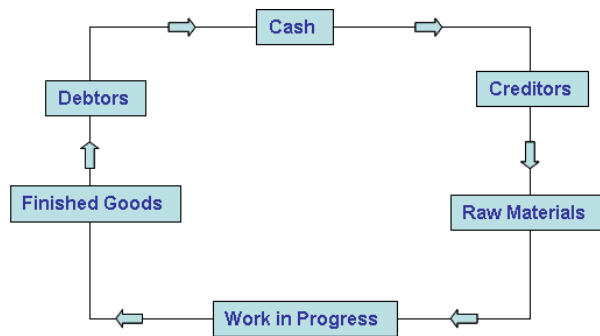


Figure 2.22: The Working Capital Cycle  
Based on Keown et al. (2004)

In relation to performance measurement, one financial metric used within the SCOR model is cash-to-cash cycle time (Supply Chain Council, 2009). This is defined by adding the number of day's worth of inventory held to the number of days of receivables outstanding and then subtracting the number of days of payables outstanding. The result is a measure of the number of days of working capital that are tied up in managing the supply chain. The work of Randall and Farris (2009) shows how metrics such as cash-to-cash cycle times that have traditionally been applied at firm level can be logically extended to the external supply chain to create “a potential tool to align and improve the financial performance of collaborating firms” and go on to note that “during economic downturns and times of tight credit proactively managing financials across the supply chain may be the only way some suppliers remain afloat” (p. 669).

#### 2.10.4 Managing Information Flows

As shown in Figure 2.16 information flows in the supply chain are bidirectional. From an SCM perspective, it can be argued that managing the information flows is the most critical of the activities described in this section. This is because the flow or movement of materials or money is usually triggered by an associated information movement. Effective management of material and money flows is, therefore, predicated upon the effective management of the related information flows. For example, Kaipia (2009) shows how the balance between material and information flows is influenced by selection of a supply chain planning mechanism. It is not surprising, therefore, that there is a huge interest in this area in the literature (see, for example: Evans et al., 1993; Mason-Jones and Towill, 1998; Gimenez and Lourenco, 2008). The bullwhip effect to which Forrester (1958) referred is essentially the product of poor information management in the supply chain and leads to a requirement to hold excessive levels of inventory. The corollary of this is that if levels of demand visibility are high throughout the supply chain then inventory levels can be reduced. As Christopher (2005) notes, good information effectively becomes a substitute for high levels of inventory. Simatupang et al. (2002) illustrate the importance of effective information management using the example of WalMart. WalMart shares point of sales data (for example, sales and stocking data) with key suppliers, which enables these suppliers to, for example, differentiate popular from slow-moving items and to respond appropriately. This coordination “dramatically increases product availability and reduces inventory costs” (Simatupang et al. 2002, p. 289). In this way the twin SCM objectives (*Fundamental One*) of improved customer service (in the form of increased product availability) and optimised costs (in the form of reduced inventory costs) are achieved.

Recent years have also seen rapid developments in the ICT used to facilitate SCM. McDonnell et al. (2004) proposed a taxonomy of supply chain ICT solutions which identifies four primary categories as follows:

1. **Point solutions** - used to support the execution of one link (or point) in the chain (e.g. warehouse management systems or WMS);
2. **“Best of breed” solutions** - where two or more existing stand-alone solutions are integrated, usually using middleware technology;
3. **Enterprise solutions** - based on the logic of enterprise resource planning (ERP), these solutions attempt to integrate all departments and functions across a

company into a single computer system that can serve all those different departments' particular needs; and,

4. **Extended enterprise solutions (XES)** - refers to the collaborative sharing of information and processes between the partners along the supply chain using the technological underpinnings of ERP.

The move away from point towards enterprise solutions in many ways reflects the shift from internal and functional, to external and process, management orientations in recent years (as highlighted in section 2.5). Other technologies, in particular electronic data interchange (EDI) and the Internet<sup>19</sup>, have enabled supply chain partners to use common data. As noted by Christopher (2000), this facilitates supply chain agility as companies can act based on “real demand, rather than be dependent upon the distorted and noisy picture that emerges when orders are transmitted from one step to another in an extended chain” (p. 39). Thus, effective adoption of ICT becomes a key enabler of integration in the supply chain requiring managers to – as noted by Vanpouckle et al. (2009) – “selectively invest in IT according to an overall supply chain integration strategy” (p. 1213). The recent structured literature review of Zhang et al. (2011) suggests “that generally, there is a positive direct or indirect effect of ICT on performance and SCM” (p. 1215).

#### ***2.10.5 Fundamental Three: Summary and Some Concluding Points***

*Fundamental Three* provides the key to putting the philosophy of SCM, as outlined in *Fundamental Two*, into operational practice. It highlights the specific activities that need to take place, and places a strong emphasis on the need for an integrated and holistic approach to their management. A stepwise decomposition of the buy–make–store–move–sell model, as carried out in the SCOR model, identifies in more detail what these activities are and how they interact. Indeed, most of the activities typically seen by companies as being part of SCM relate to the planning and control of these elements of supply chain functionality (Fawcett and Magnan, 2002). In this context, “planning and control” is concerned with material, money and information throughout the supply chain.

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<sup>19</sup> The paper of Gimenez and Lourenco (2008) provides a useful overview of the impact of the Internet on various processes that SCM embraces.

## 2.11 *Fundamental Four*: Supply Chain Relationships

Figure 2.23 (below) highlights the role of *Fundamental Four* in the context of the wider construct.

<i>Fundamental One</i>	Setting SCM Objectives
<i>Fundamental Two</i>	SCM Philosophy: Integration
<i>Fundamental Three</i>	Managing Supply Chain Flows
<i>Fundamental Four</i>	Supply Chain Relationships

Figure 2.23: *Fundamental Four* of SCM

### 2.11.1 *Supply Chain Relationship Management*

The need to replace fragmentation with integration (as advocated in *Fundamental Two*) and the holistic approach to flow management (as advocated in *Fundamental Three*) requires a reappraisal of the way in which both internal and external customer/supplier relationships are created and managed. As noted by Sweeney (2005, p. 108): “SCM is not a ‘zero-sum’ game based on adversarial relationships. Rather, it needs to be a ‘win–win’ game based on partnership approaches”. This point is relevant to the interactions between the key *internal* supply chain functions of buy, make, store, move and sell, as well as to relationships between an organisation and its external customers and suppliers. Several of the SCM definitions in the literature highlight the importance of relationship management. For example, Monczka et al. (1998, p. 78) refer to the requirement for “joint relationships with suppliers across multiple tiers”. La Londe and Masters (1994) suggest that supply chain strategy includes, “... two or more firms in a supply chain entering into a long-term agreement; ... the development of trust and commitment to the relationship; ... the integration of logistics activities involving the sharing of demand and sales data” (p. 38). The CSCMP definition (CSCMP, 2009) specifically embraces the concept of “co-ordination and collaboration with channel partners”. Lambert et al. (1998) go even further by suggesting that the management of relationships across the supply chain is itself being referred to as supply chain management. A recent study of over 200 US manufacturing companies by Lado et al. (2011) supported this view and concluded that supply chain partners must “continually develop and leverage the relational competencies in order to enhance firm competitiveness” (p. 202). Finally, it should be noted that business-to-business (B2B) relationships have long been a subject of interest amongst marketing researchers and that a large body of associated literature exists (see, for example: Flint et al., 1997; Gummerrsson, 1999; Payne and Frow, 2004).

### 2.11.2 Types of Relationships

Lamming (1993) highlighted the need to move: from “zero-sum” to “win-win” games; from competitive to collaborative approaches; and, from adversarial to partnership relationships (and beyond<sup>20</sup>). As noted in relation to *Fundamental Two*, various degrees of integration between upstream and downstream organisations exist depending upon a range of factors. It is not surprising, therefore, that in reality many different possible relationship types exist. Quinn and Hilmer (1994) categorised relationships based on the trade-off between the need for flexibility and the need for control, as shown in Figure 2.24. Choosing the appropriate relationship model is a key issue in any given situation.



Figure 2.24: Categories of Customer/Supplier Relationship  
Source: Modified from Quinn and Hilmer (1994)

Croom et al. (2000) identified ten variables which influence the nature of relationships between actors in a network. These include the attitude and commitment to collaborative improvement programmes, legal issues and the degree of power and influence of each party. It is widely recognised that, as noted by Lambert and Cooper (2000), “the closeness of the relationship at different points in the supply chain will differ” (p. 69). In other words, it is not a case of “one size fits all”. A key management decision involves determination of the appropriate relationship that best suits a particular set of circumstances. With this in mind de Leeuw and Fransoo (2009) postulated a conceptual model that may be used as the basis of a roadmap for determining the appropriateness of different types of supply chain collaboration.

### 2.11.3 The Impact of Vertical Disintegration

As noted in section 2.2.3, companies are increasingly focussing on what they regard as their core activities or competencies. The corollary of this is that activities regarded as

<sup>20</sup> As suggested in the title of his book: *Beyond Partnership: Strategies for Innovation and Lean Supply*.



“non-core” are being outsourced with key supply chain activities such as transportation, warehousing and manufacturing outsourced to third-party organisations. This has resulted in a shift away from the traditional model of “control through ownership” towards models which are based on management and control through effective supply chain relationship management (see, for example, Christopher, 2005). In short, as this process of vertical disintegration has taken place so supply chain architectures have become more virtual. For example, at the stage referred to by Gattorna et al. (2003) as “Virtual Supply Chains” (see Figure 2.5), there is an emphasis on “Networks of Businesses” and “Virtual Network Consortia” (VNC). As noted in section 2.2.3, the traditional *fully vertically integrated* approaches are being replaced by contemporary *fully virtually integrated* approaches – a new FVI is evolving. This has sharpened the focus on the need for the creation of appropriate relationship forms throughout the supply chain, as well as on their effective management.

#### **2.11.4 Strategic Partnering**

Much of the literature presents the partnership approach as an ideal. For example, Harland et al. (1999, p. 659) argued that: “The search for closer co-operation and integration is evident not only with customers; suppliers are increasingly being viewed as partners, becoming more deeply involved in co-operative problem solving”. In a truly strategic partnership approach a number of features should be evident (Rothery and Robertson, 1995), as follows:

- Senior management from both firms meet regularly;
- Payments relate to specified business outcomes or pre-agreed levels of performance rather than fixed work volumes;
- Outsourcing contracts usually last for five years or longer;
- Disclosure takes place of costs and margins between both the parties;
- Each is involved in the other partner’s strategic planning;
- Partner is not chosen on the basis of a competitive tendering process;
- Each partner searches for ways to reduce total costs of the partnership; and,
- Each partner must genuinely add value.

However, as noted by Stone (2002, p. 15): “In reality, few partnerships are arrangements between equal parties.” Fernie (1998) went further by noting that there is an impression that companies enter some form of partnership but in many cases lip service is being paid to the idea. Lamming (1993) also referred to the “lip service” trap

in relation to customer/supplier partnerships in the sense that “if companies talk about it for long enough, they begin to believe they are doing it”.

### 2.11.5 The People Dimension

It is important to note that relationships are in essence about people. For example, Grieco (1989) recognised that effective SCM rests on the so-called “twin pillars” of trust and communication. Ellinger (2002) identifies the role of “predominantly informal processes based on trust, mutual respect and information sharing, the joint ownership of decisions, and collective responsibility for outcomes” (p. 86). Lambert et al. (1998) proposed that the fundamental management components of SCM can be classified as shown in Figure 2.25 (below).

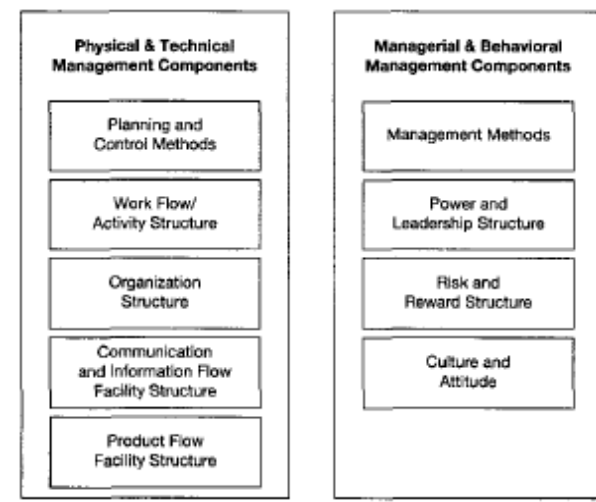


Figure 2.25: Components of SCM  
Source: Lambert et al. (1998, p. 10)

The “physical & technical management components” might be characterised as the “hard-wiring” of the supply chain while the “managerial and behavioural management components” relate to the “soft-wiring”. The latter components are all concerned with the people dimension of SCM and the model indicates their important role in the overall SCM paradigm.

Another important aspect of the people dimension relates to the role of management in supply chains. As noted by Lee (2004) in the *Harvard Business Review*, “there are no technologies that can do those things; only managers can make them happen” (p. 11). Mangan and Christopher (2005) suggest that contemporary SCM requires managers with a “T-shaped” profile. This recognises the need for in-depth expertise in one discipline combined with sufficient breadth of understanding to facilitate interactions

with others. In line with this and with specific reference to future skill requirements for supply managers, Giunipero et al. (2006) suggest that communication skills, as well as technical and financial skills, will be important. A number of authors have proposed the concept of supply chain learning (Bessant et al, 2003; Sweeney et al, 2005). This involves leveraging the supply chain as a mechanism for inter-firm competency development. Bessant et al. (2003) outline several possible benefits of this type of approach but recognise that inter-firm learning is not necessarily a natural feature of business networks.

The people dimension in SCM is important from many perspectives (including relationships, management development and the potential role of supply chain learning). However, Storey et al. (2006, p. 754) acknowledge the “crucial importance of the behavioural and people dimension but the relative neglect of this in any substantive form”. The work of Fawcett et al. (2008) draws a similar conclusion:

People are the key bridge to successful collaborative innovation and should therefore not be overlooked as companies invest in supply chain enablers such as technology, information, and measurement systems (p. 35).

This highlights the imbalance between the “soft wiring” (i.e. people) and the “hard-wiring” (e.g. technology, information, and measurement systems) in the supply chain improvement initiatives of firms. More recently, Tokar (2010) suggested that the issue of human behaviour has been largely neglected in logistics and SCM scholarship and presented a case for the importance of research in this area:

based on the belief that such research would offer theoretical richness to both areas, significantly improve the predictive accuracy of available models, and increase the efficiency of SCM and logistics in practice (p. 99).

In relation to supply chain learning specifically, Bessant et al (2003) acknowledge that “it is still at an early stage and being made with faltering steps” (p. 182). Similarly, Mangan and Christopher (2005) recognise that “there is still some way to go” in building the required SCM skills and competencies (p. 189).

#### ***2.11.6 Fundamental Four: Summary and Some Concluding Points***

Based on the foregoing, the creation and management of partnerships with all customers and suppliers (internally and externally) is not what *Fundamental Four* is about. As stated earlier, it is about recognising that putting SCM philosophy into practice requires a reappraisal of such relationships. There is no “one size fits all” approach to this. There

are many possible relationship forms and choosing the right ones in specific situations is the key. Nonetheless, one of the biggest manifestations of the application of SCM in recent years has involved the move away from adversarial relationships with key external suppliers towards relationships which are based on mutual trust and benefits, openness and shared goals and objectives. As noted by Harland et al. (1999, p. 659), “there has been an observed shift away from multi-sourced adversarial trading with suppliers, towards single or dual sourcing, resulting in a reduction (or ‘rationalisation’) of supplier bases used by firms”.

## 2.12 Unified Definition of SCM: Some Concluding Points

It is worth returning to the work of Stock and Boyer (2009) alluded to in section 2.7. Using the qualitative analysis software *NVivo*, their study examined 173 definitions of SCM that have appeared in the literature “to determine important components of an integrated definition of SCM” (p. 690). Three major themes, and a number of associated sub-themes, that occurred repeatedly across these definitions were identified as shown in Figure 2.26.

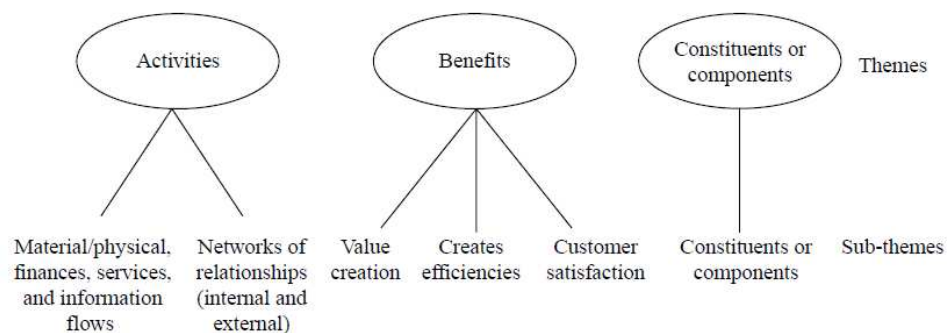


Figure 2.26: Themes and Sub-themes in SCM Definitions  
Source: Stock and Boyer (2009, p. 698)

Based on these sub-themes, they state that:

Overall, when examining the SCM definitions published through 2008, it was unusual to find definitions that included all six sub-themes. Of the 173 unique definitions identified, only a relatively few (eight in total) possessed all sub-themes (p. 699).

Table 2.5 (below) shows how each of the sub-themes is addressed in the *Four Fundamentals* construct.

	<i>Fundamental One</i>	<i>Fundamental Two</i>	<i>Fundamental Three</i>	<i>Fundamental Four</i>
Material/physical, finances, services and information flows			X	
Networks of relationships		X		X
Value creation	X			
Creates efficiencies	X			
Customer satisfaction	X			
Constituents or components		X		

Table 2.5: Stock and Boyer (2009) and the *Four Fundamentals*

The three sub-themes that relate to “benefits” are explicitly dealt with in *Fundamental One*. Customer and shareholder value creation is achieved through the simultaneous creation of efficiency (i.e. the optimisation of total supply chain costs) and achievement of customer satisfaction (i.e. meeting or exceeding the required or demanded customer service levels in targeted markets/segments). *Fundamental Two* recognises the key constituents or components both in the internal supply chain (i.e. “buy-make-move-store-sell” – see Figures 2.14 and 2.15) and in the external supply chain (i.e. source through to consumer – see Figure 2.16). Both the internal and external supply chain configurations alluded to in *Fundamental Two* represent networks comprising these constituent or component elements. *Fundamental Four* is concerned with the relationships between these elements. Finally, *Fundamental Three* recognises the role of the management of material/physical, finances, services and information flows in the SCM paradigm. Thus, all six of the sub-themes of Stock and Boyer (2009) are captured in the *Four Fundamentals* construct. This supports the author’s contention that the construct concisely, yet comprehensively, defines the essence of SCM, as it has evolved from a variety of disciplines over time and, therefore, represents a robust definition of SCM.

In this regard, questions need to be raised about the extent to which an understanding of SCM, as contained in such a definition, is a prerequisite for effective implementation. As noted by Fawcett and Magnan (2002, p 359-360):

SCM definitions vary widely from company to company and even from manager to manager within the same company. As a result, not only do SCM practices lack cohesion and visibility but supply chain strategies lack specificity and reach. Managers must be precise in their discussions of specific practices – this is true both within the firm and among channel members.

These are themes into which the research described in this thesis attempts to provide fresh insights.

## **2.13 SCM: The Role of Logistics and Other Antecedents/Perspectives**

### ***2.13.1 Logistics and the Four Fundamentals of SCM***

From the foregoing, it is clear that one of the principal antecedents of SCM is the field of logistics. In terms of the four conceptual perspectives of Larson and Halldorsson (2004), the *Four Fundamentals* could be regarded as “unionist intersectionist”. It is unionist in that it does view logistics as one element of the wider SCM field. Logistics, with its primary focus on the effective and efficient movement and storage of materials, plays a critical role as part of *Fundamental Three*. Nonetheless, the strategic and integrative role assigned to SCM by the intersectionist perspective is in line with the *Four Fundamentals*, in particular *Fundamental Two*. The concept of using SCM as a source of strategic leverage, as discussed earlier, is in line with this view. This relates directly back to the need for clear SCM objectives – as articulated in *Fundamental One* – which link directly with the overall corporate mission and objectives of an organisation.

### ***2.13.2 Other Antecedents and Perspectives***

This section began by noting that one of the principal antecedents of SCM is the field of logistics. However, it is not the only antecedent. Indeed, one of the difficulties in carrying out a comprehensive SCM literature review is that there has been a proliferation of relevant literature in recent years with research carried out from a range of perspectives. In addition to the transportation and logistics literature stream, a large amount of relevant material has been developed from a purchasing and supply perspective. As noted in section 2.1, Tan (2001) illustrates the evolution of SCM from both a purchasing and supply perspective, as well as a transportation and logistics perspective. He suggests that although SCM has developed along these two quite separate paths, “it has eventually merged into a unified body of literature with a

common goal of waste elimination and increased efficiency” (p. 46). Other scholars (for example: Min and Mentzer, 2000; Svensson, 2002) suggest that SCM can be clearly traced back to origins in the field of marketing. Min and Mentzer (2000) identify “cause and effect relationships among several important concepts in business research and practice: the marketing concept, a marketing orientation, relationship marketing, and SCM” (p. 782). Figure 2.27 is a graphical representation of these relationships ultimately leading to “differential advantage”.

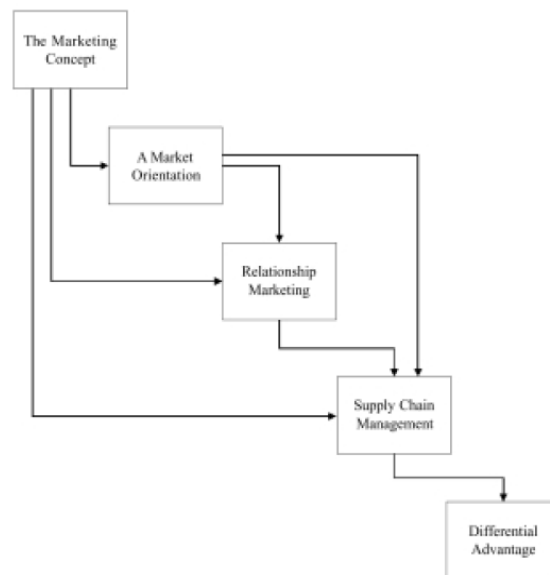


Figure 2.27: The Role of Marketing in SCM  
Source: Min and Mentzer (2000, p. 780)

One recently developed model (Mentzer et al., 2008) provides a useful representation of SCM’s relationship with a number of other fields (namely logistics, marketing, production and operations management), as well as proposing a focus for future research in these domains (see Figure 2.28 below). In this schema, logistics, marketing and production are regarded as functional areas and research in these domains (“Level 1 Research”) is deemed to be based on examination of functional level phenomena. Operations management takes place within the firm and the research agenda (“Level 2 Research”) is about examination of the relationships among intra-firm functional phenomena. Finally, SCM looks beyond the boundary of the firm and the research agenda (“Level 3 Research”) is concerned with examination of inter-firm supply chain phenomena. The authors are clear that their schema does not imply that operations management is in any way “elevated” in status or importance above logistics, marketing or production. Similarly, neither is SCM in any way “elevated” in status or importance above operations management. Rather, the framework aims to enhance understanding of the domains and limits of different areas of business.

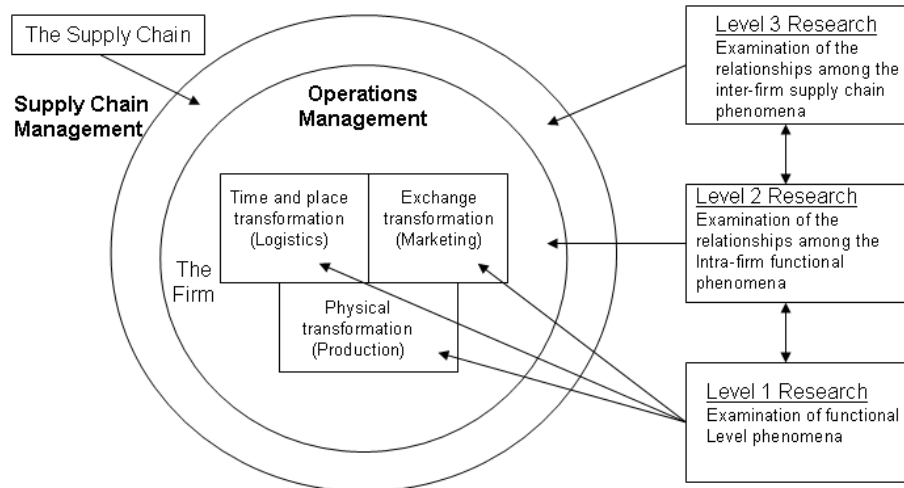


Figure 2.28: A Hierarchy of Research Focus  
Source: Mentzer et al. (2008, p. 42)

### 2.13.3 Summary and Some Concluding Points

The primary focus of this section has been on examining the relationship between SCM and one of its main antecedents, i.e. logistics, particularly in the context of the *Four Fundamentals* of SCM. However, given the diverse origins of SCM and the centrality of integration within the SCM paradigm (see *Fundamental Two*) the relationship between SCM and a number of other domains has also been noted.

## 2.14 Reflection on the *Four Fundamentals*: From a Unified Definition Towards a Unified Theory of SCM?

### 2.14.1 Background

As noted earlier, the author believes that the *Four Fundamentals* concisely, yet comprehensively, defines the essence of SCM, as it has evolved from a variety of disciplines over time. However, as the *Four Fundamentals* goes beyond the often quite trite one-line definitions, it also begins to capture some of the main elements of effective SCM practice. Indeed, and as shown in the preceding sections, the approach has been developed in the light of the quite well documented elements of SCM “best practice” found in the literature. It could be argued, therefore, that the comprehensive nature of the *Four Fundamentals* means that it represents something more than a “unified definition” of SCM; rather, it integrates many of the key elements of earlier SCM “theory” into a set of constructs which, whilst not in itself purporting to be a “unified theory”, does capture the essence of effective SCM practice. In this way, it



could be argued that the *Four Fundamentals* represents a bridge between definitional theory and practical implementation. In this context, this section reflects on the *Four Fundamentals* in the light of three well known and widely cited sets of constructs or “idealised schemas” of SCM practice. By definition, these three approaches are not exhaustive of what appears in the literature but they are indicative of the approaches set out by various scholars in recent years.

#### **2.14.2 Lummus and Vokurka Practical Guidelines**

The paper of Lummus and Vokurka (1999) was cited earlier in relation to the historical evolution of SCM. Based on the authors’ analysis of the history of SCM, the concluding part of their paper sets out some guidelines for companies “to begin managing across the entire supply chain” (p. 16). The seven guidelines are summarised in Table 2.6 (below).

<b>Guideline No.</b>	<b>Description</b>
1	Link supply chain strategy to overall business strategy to align supply chain initiatives to business objectives.
2	Identify supply chain goals and develop plans to assure every process is individually capable of meeting supply chain goals.
3	Develop systems to listen to signals of market demand and plan accordingly, including changes in ordering patterns and changes in demand due to customer promotions.
4	Manage the sources of supply by developing partnerships with suppliers to reduce the costs of materials and receive materials as needed.
5	Develop customized logistics networks tailored to each customer segment.
6	Develop a supply chain information systems strategy that can support decision making at all levels of the supply chain and offers a clear view of the flow of products.
7	Adopt cross-functional and cross-business performance measures that link every aspect of the supply chain and include both service and financial measures.

Table 2.6: Guidelines on Good SCM Practice  
Source: Modified from Lummus and Vokukra (1999)

There is a strong degree of compatibility between these guidelines and the *Four Fundamentals*. Guidelines one and two have a strong focus on business objectives and supply chain goals; *Fundamental One* suggests that SCM implementation is predicated on the ability of firms to set out clear supply chain objectives. Guideline three lays emphasis on the need for systems which “listen to signals of market demand and plan accordingly”; *Fundamental One* states that understanding customer service

requirements sets the specification for SCM. Guideline four is concerned with the establishment of partnerships with suppliers; *Fundamental Four* goes beyond this by asserting that SCM is largely concerned with relationships, often based on partnership concepts, with internal and external customers as well as suppliers. Guideline five relates to the “development of customised logistics networks”; *Fundamental Three* refers to the holistic management of material flows across the supply chain. Guideline six is concerned with supply chain information systems, with a strong emphasis on product flow visibility; *Fundamental Three* recognises the centrality of information flow management in effective SCM. Finally, guideline seven relates to the role of performance measurement across the supply chain; *Fundamental Two* noted that traditionally supply chains were often measured, and therefore managed, in isolation and that more integrated KPIs are required if fragmentation is to be replaced by integration.

#### **2.14.3 Burgess et al. Constructs of SCM**

Burgess et al. (2006) proposed a set of seven constructs of SCM. In this context, the definition of a “construct” is based on the work of Nunnally (1978) as a higher order abstract variable that is not necessarily directly measurable, but which provides a more rounded definition of the underlying concepts. Burgess et al. (2006, p. 709) go on to state that:

For the SCM field, agreement on a common set of constructs does not appear to exist. Some researchers use a single overarching construct to cover all aspects of SCM (Ho et al., 2002), whilst others use a myriad collection of narrowly defined constructs (for example, Chen and Paulraj (2004) define 18 constructs and Min and Mentzer (2004) describe 24 constructs). In the absence of consensus on a common set of SCM constructs, we decided to consolidate, to a reasonable list, the constructs proposed by researchers such as Chen and Paulraj (2004), Min and Mentzer (2004) and Tracey et al. (2004) by focusing on the commonalities amongst these lists. The final outcome was a set of seven constructs.

The seven constructs are shown in Table 2.7 (below).

<u>Construct</u>	<u>Description</u>
Leadership	capturing the strategic nature of SCM and the need for senior management team to be proactively involved
Intra-organizational relationships	focusing on the nature and type of social and economic associations between stakeholders within organizations
Inter-organizational relationships	focusing on the nature and type of social and economic associations between stakeholders between organizations
Logistics	describing the issues associated with movement of materials within and between entities in a supply chain
Process improvement orientation	Processual arrangements that facilitate interactions within and between organizations, with a view to continually improving them
Information system	covering aspects of communication both within and between organizations
Business results and outcomes	capturing performance related outcomes that organizations accrue from adopting strong SCM orientation

Table 2.7: Seven Constructs of SCM  
Source: Modified from Burgess et al. (2006)

The first construct is concerned with the strategic nature of SCM; the *Four Fundamentals*, taken as a whole, recognises that SCM is first and foremost a strategic concern, with *Fundamental Four* specifically recognising the role of management and leadership across the supply chain. Constructs two and three emphasise the importance of both intra-organisational and inter-organisational relationships; *Fundamental Four* asserts the role of relationship management in the context of strengthening internal and external (i.e. intra-firm and inter-firm) integration. The role of logistics in the wider supply chain is captured in construct four; as noted in relation to the Lummus and Vokurka guidelines, *Fundamental Three* refers to the holistic management of material flows across the supply chain – i.e. the need for integrated logistics. Construct five notes the need for “processual arrangements that facilitate interactions within and between organizations, with a view to continually improving them”; *Fundamental Three* asserts the importance of the holistic management of material, information and money flows both internally and externally as the basis of supply chain operations and control. Construct six (which is very similar to the sixth guideline of Lummus and Vokurka) is concerned with supply chain information systems, with a strong emphasis on communication; as noted above, *Fundamental Three* recognises the centrality of information flow management in effective SCM. Finally, construct seven (analogous to guideline seven of Lummus and Vokurka) relates to supply chain performance measurement; *Fundamental Two* (as noted above) stated that more integrated KPIs are required if fragmentation is to be replaced by integration.

#### 2.14.4 Storey et al. Idealised Schemas

The paper of Storey et al. (2006) is based on a three-year study of six supply chains encompassing 72 companies. As part of their analysis they recognise that much of the theory in this field is based on “idealised schemas of optimal routes and quantities for demand fulfilment when considered from a whole-network or chain perspective” (p. 760). These idealised schemas vary in detail when advanced by various proponents but there are a number of relatively common elements which Storey et al. (2006) summarise (see Table 2.8, below) as the “the characteristics underpinning the ideally managed supply chain” (p. 760).

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1	Seamless flow from initial source(s) to final customer
2	Demand-led supply chain (only produce what is pulled through)
3	Shared information across the whole chain (end to end pipeline visibility)
4	Collaboration and partnership (mutual gains and added value for all; win-win; joint learning and joint design and development)
5	IT enabled
6	All products direct to shelf
7	Batch/ pack size configured to rate of sale
8	Customer responsive
9	Agile and lean
10	Mass customisation
11	Market segmentation

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Table 2.8: Idealised SCM Characteristics  
Source: Storey et al. (2006, p. 760)

As with the guidelines of Lummus and Vokurka (1999) and the constructs of Burgess et al. (2006) these ideal characteristics of SCM again largely mirror – to greater or lesser extents – the *Four Fundamentals* of SCM. For example: characteristic one (“seamless flow from initial source(s) to final customer”) is in line with the integration principle of *Fundamental Two*; characteristic two (“demand-led supply chain”) is analogous to the principle espoused in *Fundamental One* that understanding customer requirements sets the specification for (or leads) the supply chain; characteristic three (“end to end pipeline visibility”) is an integral element of *Fundamental Three* (i.e. the need for holistic management of the information flows across the supply chain or pipeline); characteristic four (“collaboration and partnership”) is almost identical to the treatment of relationships and partnerships in *Fundamental Four*. The remaining seven idealised characteristics, albeit less directly and explicitly, can all find expression in one or other of the *Four Fundamentals*.

### ***2.14.5 Summary and Some Concluding Points***

As noted in the introduction to this section, the *Four Fundamentals* of SCM is primarily a comprehensive definition. However, the author contends that it goes beyond a purely definitional focus. It does not purport to position itself as a “unified theory of SCM” – as noted earlier, it is debatable whether it is either possible or desirable to develop such a theory. However, its comparison with some of the practical guidelines, constructs and idealised schemas of SCM indicates that it provides a sufficiently robust basis for much of the research to be described in this thesis.

## **2.15 Research Questions**

### ***2.15.1 Introduction and Theoretical Context***

There is significant evidence that the effective implementation of SCM can result in improvements in the performance of firms. For example, on the basis of a study of 196 firms Li et al. (2006) concluded that higher levels of SCM practice “can lead to enhanced competitive advantage and improved organizational performance” (p. 107). More recently, a study by Johnson and Templar (2011) of 117 publicly traded UK manufacturing firms indicated that “improving SCM practices has a positive impact upon improved firm performance” (p. 88). Recent studies in a US setting by Elmuti et al. (2008) and Ellinger et al. (2011) reveal similar relationships between SCM adoption and firm success. Based on their study of firms in the Taiwanese IT sector, Ou et al. (2010) stated that:

The results presented in this paper show that external customer-firm-supplier relation management positively impacts firm internal contextual factors, which in turn have positive effects on firm performance. This finding suggests that a successful implementation of SCM not only directly improves operational performance, but also indirectly enhances customer satisfaction and financial performance (p. 526).

More recently, the work of Lado et al. (2011) supported this view and documented how supply chain relational capabilities engender competitive advantage. These findings are significant given – as noted in *Fundamental Four* (see section 2.11) – the increasingly important role of relationship management in SCM. Similarly, the work of Frohlich and Westbrook (2001) based on a survey of 322 global manufacturers strongly supported the hypothesis that “the companies with the greatest arcs of supplier and customer integration will have the largest rates of performance improvement” (p. 193). This is

also significant given – as noted in *Fundamental Two* (see section 2.9) – the centrality of integration in SCM philosophy. However, Fabbe-Costes and Jahre (2008), based on a systematic review of 38 papers on the subject of supply chain integration (SCI) note that:

Even though half of the papers of our total sample conclude that SCI has a positive effect on performance, the variety of empirical bases and the research design of the studies suggest that caution is advisable (p. 140).

In a similar vein, Storey et al. (2006) assert that, “while there is an emerging body of theory which ostensibly offers a relatively coherent and compelling prescriptive narrative, predominant practice is at considerable odds with this conceptualisation” (p. 755).

### ***2.15.2 Divergence of Theory and Practice***

As noted earlier, many scholars have discussed the lack of a robust theoretical foundation in the SCM field. Several attempts have been made to address this perceived challenge with varying degrees of success. At present there is certainly no universally agreed upon unified theory of SCM. As noted in section 2.6.4, in their paper Halldorsson et al. (2007) conclude that “the main message in this paper is that there is no such thing as a ‘unified theory of SCM’” (p. 292). As noted by Voss et al. (2002) the development of the SCM field has been largely practitioner-led, with theory (such as it is) largely following practice. This view is reinforced by Lambert and Cooper (2000) who state that, “Thus far, there has been relatively little guidance from academia, which in general has been following, rather than leading, business practice.” (p. 65). Furthermore, the practical experience upon which this “theory” is based is often confined to a relatively small number of key industry sectors. For example, Burgess et al. (2006) state that:

Anecdotally, the SCM literature appears to be concentrated in a handful of industry sectors. Examples to illustrate SCM concepts are mostly chosen from industries such as consumer goods retailing, computer assembling and automobile manufacturing (p. 707).

The comprehensive literature review of Chen and Paulraj (2004b) noted that “practitioners are far from mastering SCM” (p. 150). Some authors, while asserting that SCM is a sound concept have noted that turning the idea into practice is not easy and that it has so far received more lip service than accomplishment, except in a few leading edge companies (Leenders et al., 2002).

Carter and Narasimhan (1994) noted that the incorporation of SCM into the overall business planning process is not widely practiced. As noted earlier, the concept of integration lies at the heart of SCM philosophy. However, there is significant evidence of a divergence between theory and practice in this core area. For example, Storey et al. (2006) recognise that supply chain theory suggests that the chain should be managed from end-to-end (as suggested in *Fundamental Two*) but note that, “our research found very few examples of this” (p. 763). The work of Fabbe-Costes and Jahre (2007) concluded that, “at this point in time it seems that we can confirm that integration is more rhetoric than reality, that it might be more difficult in practice than in theory” (p. 848). Their more recent work (Fabbe-Costes and Jahre, 2008) reinforces this view.

In short, there is evidence to suggest that there are – as Storey et al. (2006) put it – “substantial gaps between theory and practice” (p. 769). Stank et al. (2011), in their recent synopsis of *The New Supply Chain Agenda* (Slone et al, 2010), make a similar point when they state that: “Unfortunately, few companies have yet to take advantage of the stakeholder value opportunity presented through supply chain activities” (p. 941). These arguments raise important questions concerning the real impact of SCM theory in practice.

### **2.15.3 The Forrester Forecast – Rhetoric or Reality?**

As was noted earlier, SCM is not new. The term may be relatively new but supply chains have existed for a very long time – in fact they have probably always existed! For example, Forrester’s often cited article from the *Harvard Business Review* in 1958 (Forrester, 1958) states that:

Management is on the verge of a major breakthrough in understanding how industrial company success depends on the interactions between the flows of information, materials, money, manpower, and capital equipment. The way these five flow systems interlock to amplify one another and to cause change and fluctuation will form the basis for anticipating the effects of decisions, policies, organisational forms, and investment choices (p. 37).

His article introduced the demand amplification concept using a computer simulation model<sup>21</sup>. If, as Forrester suggested, management was on “the verge of a major

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<sup>21</sup> More recent replications of this phenomenon include the ‘Beer Game’ simulation and research covering the ‘Bullwhip Effect’ (Lee et al. 1997).

breakthrough” over half a century ago, it seems pertinent to raise questions concerning how this breakthrough – mainly in relation to managing relationships between supply chain companies – has impacted on companies in reality. In fact over 40 years after Forrester’s article first appeared, Mentzer et al. (2001, p. 20), in concluding their paper, asked the specific question: “How prevalent is SCM?” This is a key question to which ongoing research needs provide some answers.

A number of authors have raised serious questions about the real impact of SCM in practice. Cousins et al. (2006) suggest that:

SCM still appears to suffer from an underlying frustration or perception of being largely ignored; practitioners feel they have a great deal of value to add, but the organisation is not concerned with them (p. 699).

Storey et al. (2006) raise doubts about the “more full-blown claims of many of the advocates (of SCM)” and suggest that “the pretence that SCM is a discipline which is effectively grappling with these forces is an exaggeration” (p. 771). As noted earlier, they also state that the SCM literature tends move rather imperceptibly between description, prescription and trend identification. This results in what New (1997) referred to as “normative tension” between the *is* and the *ought*:

the rhetoric of managerial folklore tells managers to feel that they should take a broad, integrative approach and ‘manage the whole chain’, and this often clouds practitioner reports, with both overstatement and yet profound cynicism (p. 16).

He goes on to suggest that “academics too are often guilty of perpetuating a type of breathless hyperbole” and to note that “researchers must grapple with the fact that (SCM) exists in the netherworld of the imperative and the actual” (p. 16). Stank et al. (2011), in setting out their proposed directions for future research state that “now, more than ever, meaningful research is required to help supply chain practitioners separate truth from hype” and that “to truly impact practice, academics must be able to provide deeper insights into...various complex and multi-dimensional SCM concepts” (p. 941).

The fundamental purpose of this research is to disentangle the rhetoric from the reality. The related fundamental question is: “What is the real impact of SCM theory in practice?” As illustrated by the small sample of papers in Table 2.9, much of the earlier empirical research in this field has focussed on specific elements of the overall SCM concept.



<b>Focus</b>	<b>Paper</b>	<b>Theme</b>
<b>Sectoral</b>	Choi and Hong (2002) Korneliusson and Gronhaug (2003) Brun et al. (2008)	Automotive Salmon farming Luxury fashion
<b>Supply chain “links”</b>	Tracey and Tan (2001) Arroyo et al. (2006) Chen and Wu (2007)	Purchasing and supply (i.e. ‘buy’) Distribution (i.e. ‘move/store’) Production (i.e. ‘make’)
<b>Tools and technology</b>	Eng (2003) Vijayaraman and Osyk (2006) Tanner et al. (2008)	E-marketplaces RFID E-procurement
<b>Performance measurement</b>	Tan et al. (1999) Toyli et al. (2008) Hsu et al. (2008)	Impact of SCM on performance Logistics and financial performance The effects of information sharing capability on buyer-supplier relationships and firm performance
<b>People dimension</b>	Poist et al. (2001) Bessant et al (2003) Mangan and Christopher (2005)	EU logistics managers’ skill requirements Supply chain learning Logistics/SCM skill requirements
<b>By country</b>	Sahay et al. (2003) Mollenkopf and Dapiran (2005) Sweeney et al. (2008)	India Australia and New Zealand Ireland

Table 2.9: Focus of SCM Empirical Research

There is a considerable body of SCM research with a focus on specific sectors. The specific drivers at play in different sectors raises questions about the extent to which the findings from such research may be generalised. There is also a considerable body of research that focuses on specific supply chain elements or “links”. Many scholars have examined aspects of purchasing and supply (i.e. the “buy” link). Similarly, there has been extensive treatment of specific transport, logistics and distribution issues (i.e. the “move” and “store” links). Production-specific supply chain domains (i.e. the “make” link) have also been widely researched. A relatively large number of papers have appeared which have a focus on SCM technology and performance issues. This reflects the proliferation of interest in these two specific areas in recent years. The former includes papers which are concerned mainly with ICT application in the supply chain; the latter includes papers which have performance measurement issues as the central theme. The growing interest in various aspects of the people dimension of SCM has resulted in a focus on these issues. The “by country” category comprises research which is aimed chiefly at discovering the state of practice in particular geographical regions.

A key aspect of this research involves moving beyond these specific foci and examining SCM in a *holistic* manner.

#### ***2.15.4 Development of Research Questions***

Based on the comprehensive literature review set out in the preceding sections of this chapter, this section sets out the main questions which the research described in this thesis attempts to answer. As noted above, the fundamental aim of this research is to disentangle the rhetoric from the reality in relation to SCM adoption in practice. It will do so in the specific context of Ireland. Based on this, and as noted earlier, the related fundamental question is: “What is the real impact of SCM theory in practice?” The following four research questions have been formulated based on this overall question.

**RQ1** - What is the current level of understanding of SCM in practice?

**RQ2** - What is the current level of adoption of SCM?

**RQ3** - What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?

**RQ4** - What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?

Figure 2.29 (below) shows how some of the key literature reviewed by the author specifically informed the development of these questions.

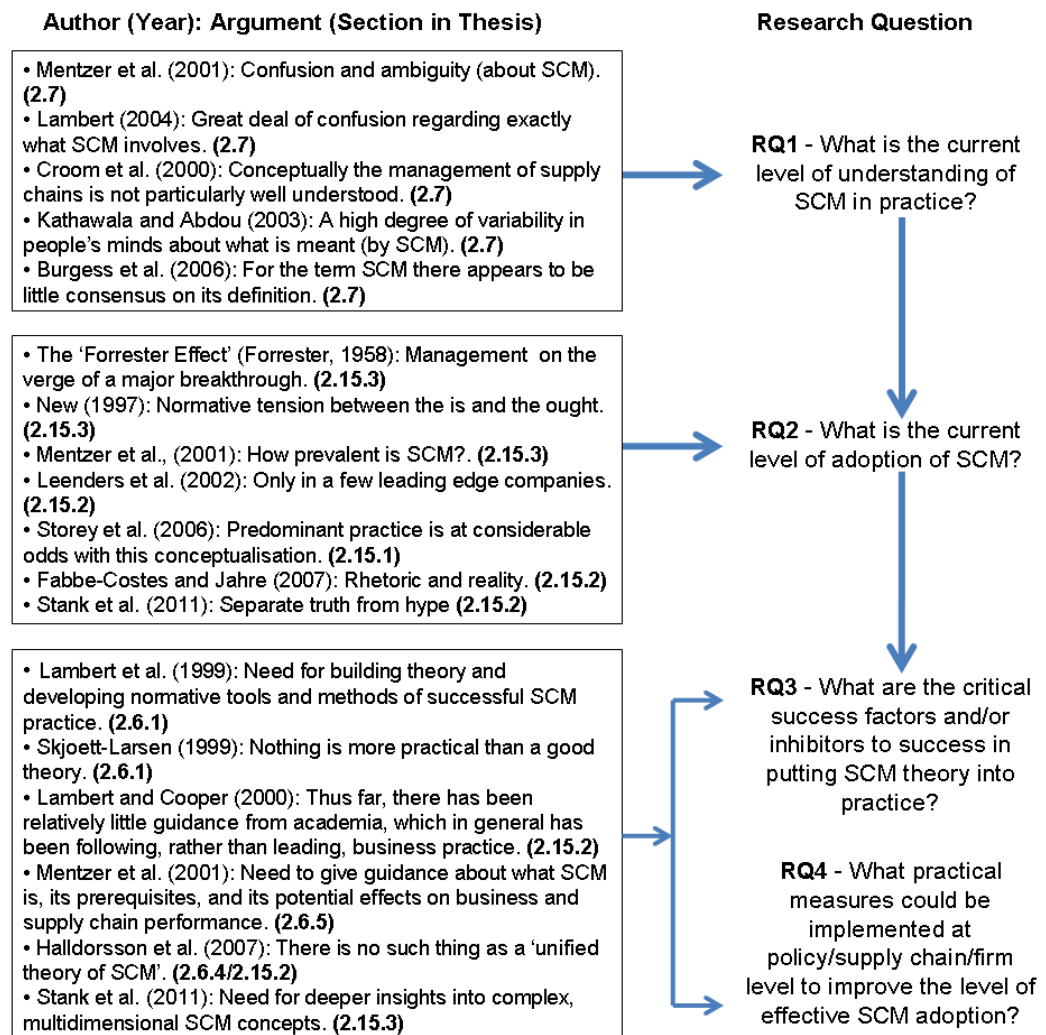


Figure 2.29: Development of Research Questions

## 2.16 Summary and Some Concluding Comments

The comprehensive literature review described in this Chapter is based on the thematic areas set out in Figure 2.2. The core areas are:

- i. evolving context (section 2.2);
- ii. historical evolution (section 2.3);
- iii. earlier definitions (section 2.4);
- iv. paradigm shifts (section 2.5); and,
- v. SCM theory (section 2.6)

The author's *Four Fundamentals* of SCM, based on his analysis of these SCM domains and described in sections 2.7 to 2.12, relate to:

1. Setting SCM objectives;

2. SCM philosophy;
3. Managing the flows; and,
4. Supply chain relationships.

The role of within SCM of one of its principal antecedents, namely logistics, as well as the relationship between SCM and other established subject domains is set out in section 2.13. Comparison between the *Four Fundamentals* and some of the practical guidelines, constructs and idealised schemas of SCM (as described in section 2.14) indicates that it provides a sufficiently robust basis for much of the research to be described in this thesis. Section 2.15 went on to set out the overall objectives of the research, as well as the research questions that will be addressed.

Based on these research questions, and using the *Four Fundamentals* as a framework, Chapter 3 goes on to set out a detailed description and justification of the research methodology to be adopted.

## CHAPTER 3

### RESEARCH METHODOLOGY

#### 3.1 Introduction

The research questions to be answered in this thesis were set out in Chapter 2 based on the preceding literature review. The structure of Chapter 3 is as shown schematically in Figure 3.1 (below).

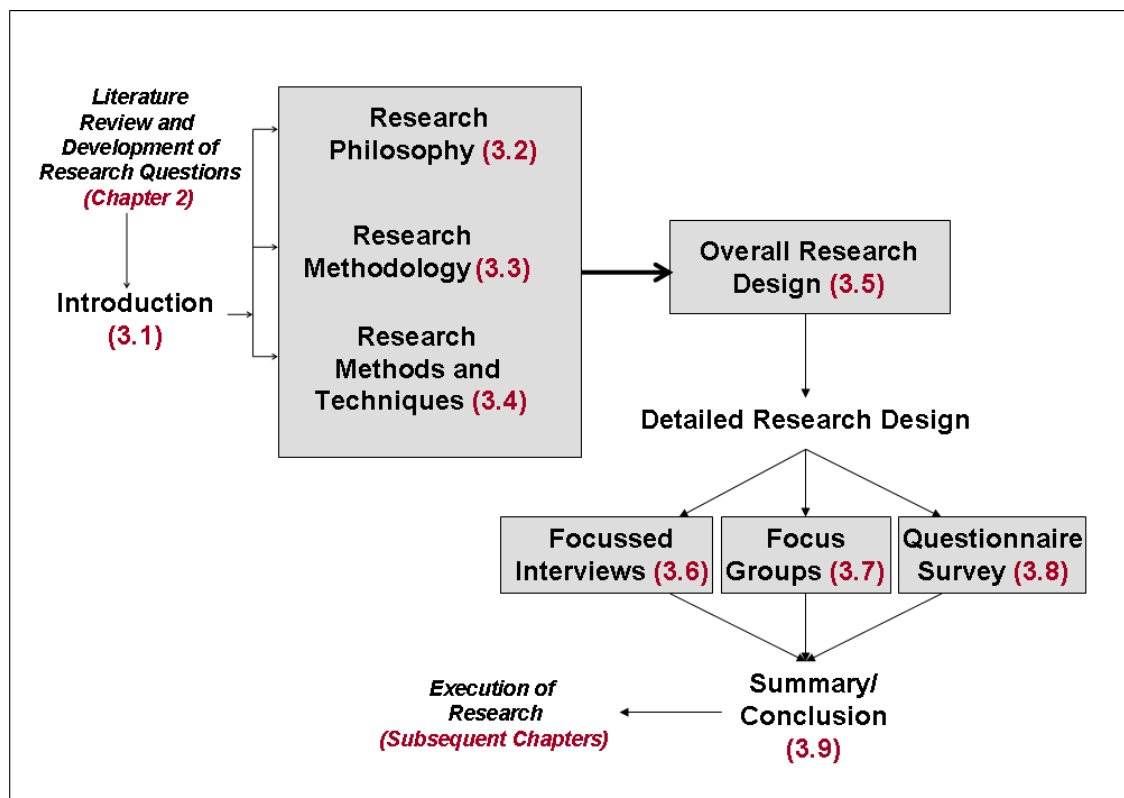


Figure 3.1: Structure of Chapter 3

Following this introduction, the chapter proceeds (section 3.2) with a discussion of the philosophical underpinnings of research. This section has a strong focus on two opposing schools of thought – positivism and interpretivism – as a means of illustrating some of the main epistemological and ontological considerations important in research. The chapter goes on (section 3.3) to discuss research methodology. This section starts by providing an overview of two approaches to carrying out research. One (deduction) is based on testing theories and is closely associated with the positivist tradition. The other (induction) is based on theory building and is associated with the interpretivist tradition. This leads directly to a discussion on the use of predominantly quantitative

and qualitative approaches, as well as on the use of combinatory methodologies. It goes on to introduce the case study, action research and grounded theory methodologies. Section 3.4 then introduces a range of specific research methods and techniques with a strong focus on the use of mixed methods and methodological pluralism. In this way, sections 3.2, 3.3 and 3.4 provide a menu of possible philosophical and methodological options, as well as of possible methods and techniques. Section 3.5 goes on to describe and justify the overall integrated research design to be used in answering the research questions set out in Chapter 2. The subsequent sections provide a detailed description of the work carried out by the author during the three main phases of the overall research design, i.e. focussed interviews (section 3.6), focus groups (section 3.7) and the questionnaire survey (section 3.8). The chapter concludes by making some general points by way of summary (section 3.9).

## **3.2 Research Philosophy**

The philosophy underpinning research of any kind is closely bound up with notions of ontology, epistemology and axiology. In particular, it relates closely to the concept of a *paradigm* with the paradigmatic preferences of the researcher determining to a great extent the detail of the methodology adopted. This section begins with a discussion of ontology and epistemology, as well as the nature of paradigms, and goes on to relate paradigmatic preferences to ontological, epistemological and other assumptions made by the researcher. It concludes by relating these preferences to the body of logistics and supply chain management (SCM) knowledge that has been developed over the years – much of which was the focus of the literature review in Chapter 2 – and by setting out the paradigmatic preferences and philosophical positionality of the author in answering the research questions set out in Chapter 2.

### ***3.2.1 Ontology and Epistemology***

The Oxford English Dictionary defines ontology as “the branch of metaphysics concerned with the nature of being”. From a research perspective, Saunders et al. (2009, p. 110) state that “ontology is concerned with the nature of reality”. Easterby-Smith et al. (2008, p. 60) go a step further by suggesting it is concerned with “philosophical assumptions about the nature of reality”. In a similar vein, Bryman and Bell (2003, p. 19) note that “questions of ontology are concerned with the nature of social entities”.

The Oxford English Dictionary defines epistemology as “the branch of philosophy that deals with knowledge, especially with regard to its methods, validity, and scope”. From a research perspective Collis and Hussey (2009, p. 59) suggest that it is concerned with the fundamental question: “what do we accept as valid knowledge?” Easterby-Smith et al. (2008, p. 60) define epistemology as “general sets of assumptions about the best ways of inquiring into the nature of the world”.

As noted earlier, the ontological and epistemological assumptions and stances of researchers have a major impact on the way in which research is carried out. In relation to SCM research this is articulated effectively by New (2009, p. 89):

Although both academic literature and practitioner discourse are happy to bandy the term ‘supply chain’ around, the implicit imagery behind the metaphor – materials flowing through the economy via some neat system of imaginary pipes – is intrinsically problematic. The difficulties arise because of questions of ontology (for example, what do we mean by ‘product’?) and epistemology (how can we know?).

The following sections discuss paradigms, in particular the positivist and interpretivist positions, with specific reference to their ontological and epistemological assumptions.

### ***3.2.2 Paradigms***

The emphasis on the concept of a paradigm in research philosophy in recent decades is usually attributed to the work of Thomas Kuhn in the 1960s. Kuhn (1962) discussed paradigms in the context of “the progress of scientific discoveries in practice” and went on to define paradigms as “universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners” (p. viii). Bryman (1988) provides a useful definition of a paradigm: “a cluster of beliefs and dictates which for scientists in a particular discipline influence what should be studied, how research should be done and how results should be interpreted” (p. 4). Gummesson (2000, p. 18) suggests that the concept can be used to represent “people’s value judgements, norms, standards, frames of reference, perspectives, ideologies, myths, theories, and approved procedures that govern their thinking and action”.

Perhaps of more interest and consequence in the context of the current research is the impact of the “world-view” represented by the paradigmatic preference of a researcher

on the conduct of research in the social sciences generally and in business research specifically. The work of Burrell and Morgan (1979) is central to this discussion. In their text *Sociological Paradigms and Organisational Analysis* they applied the notion of a paradigm to the social sciences and described four distinct paradigms (see Figure 3.2).

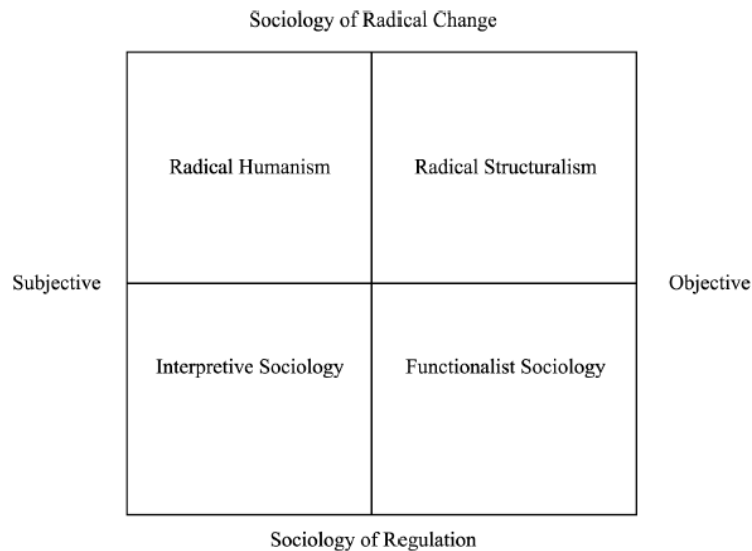


Figure 3.2: Four Paradigms for the Analysis of Social Theory  
Source: Burrell and Morgan (1979, p. 23)

In this classification, the vertical axis is concerned with assumptions about the nature of society. The horizontal axis is concerned with assumptions about the nature of social science. The latter is of particular interest from the perspective of research in business and management with researchers tending to position themselves along the subjective-objective continuum. Whilst it is important to recognize that this is a continuum, discussion and debate between adherents to the “extreme” ends of the spectrum has tended to concern itself with the relative merits of objectivist (positivist) and subjectivist (interpretivist) positions. For example, Tashakkori and Teddlie (1998) suggest that it is more appropriate for the researcher in a particular study to think of the philosophy adopted as a continuum rather than opposite positions. Morgan and Smircich (1980, p. 492) go further by proposing a six-stage continuum between “pure” positivism and “pure” interpretivism. Nonetheless, it is useful to consider the characteristics of the purist positions in order to illustrate the very different world-views represented by each. These world-views are intrinsically bound up with notions of ontology and epistemology. As noted by Guba and Lincoln (1994, p. 105):



Questions of method are secondary to questions of paradigm, which we define as the basic belief system or world view that guides the investigation, not only in choices of method but in ontologically and epistemologically fundamental ways.

### ***3.2.3 The Positivist Paradigm***

Positivism, which has its roots in the philosophy known as realism, was developed by theorists such as Auguste Comte (1798-1857), John Stuart Mill (1806-1873) and Emile Durkheim (1859-1917). It lies at the objective end of the paradigmatic continuum shown in Figure 3.2 (above). The term derives from “positive” as in progressive, its proponents believing that it offered a coherent approach to the positive and progressive development of the social sciences. Outhwaite (1987), quoted in Robson (2002, p. 19-20), noted three distinct generations in the development of positivism<sup>22</sup>.

In ontological terms, positivists believe that there is one social reality and that this reality is external to the researcher. In terms of epistemological assumptions, they try to maintain an independent and objective stance because they believe that only phenomena that are observable and measurable can be validly regarded as knowledge (Collis and Hussey, 2009). Mangan et al. (2004, p. 568) usefully capture the approach as “top-down, outside-in”. Positivists, therefore, tend to place a strong emphasis on the use of quantitative methods to deductively test hypotheses in an objective manner. The positivist paradigm has its roots in the natural sciences and was the predominant position adopted by researchers in the early days of the social sciences (around the end of the nineteenth century). However, there are many potential pitfalls associated with the adoption of this position in research related to human issues. These pitfalls resulted in some of the ontological and epistemological assumptions associated with the paradigm being challenged and a new paradigm emerging. As noted by Gummesson (2000) this new paradigm is variously referred to as – amongst others – interpretivism, phenomenology and subjectivism.

### ***3.2.4 The Interpretivist Paradigm***

As noted above, the interpretivist paradigm developed in the social sciences as a result of assumptions associated with the traditional positivist paradigmatic position being challenged. It lies at the subjective end of the paradigmatic continuum shown in Figure 3.2 (above). The term derives from the fact that the world is *interpreted* through the

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<sup>22</sup> Nineteenth century positivism; logical positivism; post-second world war positivism.

mind and that this *interpretation* leads to the phenomena under investigation being better understood. As noted earlier, there are many terms – often used interchangeably by scholars – that are widely used to describe the same basic paradigmatic position. For example, Jill Collis and Roger Hussey used the term “phenomenology” in the earlier editions of their text on business research methods. However, in the most recent edition (Collis and Hussey, 2009) they use the word “interpretivism” to “suggest a broader philosophical perspective” (p. 57). For similar reasons, the word “interpretivism” is used in this context throughout this thesis.

In ontological terms, interpretivists believe that social reality is subjective because it is socially constructed. For this reason, the phrase “social constructionism” is often used to describe this paradigmatic position – the world is seen as an emergent social process. As a result, there are multiple realities as each person has his or her own sense of reality (Collis and Hussey, p. 59). In terms of epistemological assumptions, interpretivists attempt to minimise the distance between the researcher and what is being researched based on a recognition that the observer is part of what is being observed. Mangan et al. (2004, p. 568) usefully capture the approach as “bottom-up, inside-out”. Interpretivists, therefore, tend to place a strong emphasis on the use of qualitative methods to inductively build theory in a subjective manner. The emphasis is on the development of a general understanding of phenomena, rather than causal relationships between variables.

### **3.2.5 Positionality – The “Paradigm Wars”**

“Pure” positivism and “pure” interpretivism can be regarded as extreme positions at either end of the paradigmatic continuum. Over the years there has been extensive debate about the relative merits of each position and the extent to which positionality<sup>23</sup> in paradigmatic terms impacts upon the research process. Robson (2002) refers to this debate as “so-called ‘paradigm wars’ endemic” (p. 43). Mangan et al. (2004) note that “the various paradigmatic positions are now often discussed in terms of an antithesis between two schools of philosophy” (p. 566). Similar points are made by several authors, notably Gummesson (2000) and Hussey and Hussey (1997). The forthright views of Byrne (1998) in relation to the positivist position in social sciences research is revealing: “Positivism is dead. By now it has gone off and is beginning to smell.” (p.

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<sup>23</sup> “Positionality” in this context is - as defined by, for example, Herr and Anderson (2005) - the philosophical (or paradigmatic) position or preference of the researcher.

37). Nonetheless, it is worth considering the distinctive characteristics of each position, with particular reference to ontological, epistemological and other relevant issues. These characteristics are shown in Table 3.1, which is based on a variety of sources consulted by the author<sup>24</sup>.

<b><u>Positivism</u></b>	<b><u>Interpretivism</u></b>
• Ontology: objective	• Ontology: subjective
• Epistemology: independence	• Epistemology: interdependence
• Axiology: value-free	• Axiology: value-laden
• Rhetoric: formal style of writing	• Rhetoric: informal style of writing
• Causal	• General understanding
• Deductive	• Inductive
• Theory/hypothesis testing	• Theory building
• Reductionist	• Holistic
• Operationalisation	• Stakeholder perspectives incorporation
• Generalisation	• Theoretical abstraction
• Large samples	• Small samples
• Experimental	• Interpretation
• Artificial location	• Natural location
• High reliability	• Low reliability
• Low validity	• High validity

Table 3.1: Characteristics of Positivism and Interpretivism

In terms on ontological assumptions, the positivist position is objectivist in that reality is viewed as separate from the researcher. This lies at the right-hand end of the matrix of Burrell and Morgan (1979) as shown in Figure 3.2. In contrast, the interpretivist position is subjectivist in that reality is as seen (subjectively) by the researcher. This lies at the left-hand end of the matrix of Burrell and Morgan (1979) as shown in Figure 3.2. Epistemologically, the positivist position is characterized by independence. In other words, the researcher is independent of what is being researched. Conversely, the interpretivist position recognizes the interdependence and interaction of the researcher and the researched. In other words, the observer (researcher) is part of what is being observed (researched).

Axiology is the branch of philosophy that studies judgments about the role of values (Saunders et al, 2009). Axiologically, the positivist paradigm is value-free, whereas the

<sup>24</sup> In particular, Easterby-Smith et al. (2008), Saunders et al. (2009), Bryman and Bell (2003), Robson (2002), Denzin and Lincoln (2000), Collis and Hussey (2009).

interpretivist position recognizes that the values of the researcher impact upon the research. As a consequence of this, positivist rhetoric tends to be formal using the passive voice and quantitative “words”. The interpretivist rhetoric, on the other hand, tends to adopt a more informal language using the personal voice and qualitative terms. As noted earlier, positivists look for causal relationships between variables while interpretivists are more interested in developing a general (albeit deep and rich) understanding of a phenomenon.

The development and testing of hypotheses and theory deductively is a characteristic of the positivist paradigm; interpretivists try to build theory inductively. The emphasis on quantitative hypothetico-deductive reasoning results in positivists having to reduce a situation to its simplest possible elements. This process enables variables to be operationalised (and measured). Interpretivists, on the other hand, adopt a more holistic approach, ensuring that the views of all stakeholders are considered. A key objective of positivism is to generalize findings from samples to the wider population under study. This is often achieved using relatively large samples (for example in survey-based research). In interpretivism the emphasis is on theoretical abstraction – this allows the researcher to work with relatively small samples (for example in case-based research).

Given its origins in the natural sciences, positivism has a strong emphasis on experimentation in “artificial” locations (such as laboratories). As the term implies, interpretivists focus on interpreting what is observed in natural (i.e. “real-world”) locations or settings. Collis and Hussey (2009) define reliability as “the absence of differences in the results if the research is repeated” (p. 64) and validity as “the extent to which the research findings accurately reflect the phenomena under study” (p. 65). Thus, positivists tend to emphasise high reliability with interpretivists favouring high levels of validity. Finally, it is clear from the foregoing that positivist paradigm has tended to be highly quantitative in nature while the interpretivist paradigm has tended to be more qualitative.

However, whilst the foregoing is interesting in that it provides a stark contrast between “pure” positivist and interpretivist paradigmatic assumptions and preferences, it should be noted that most research lies somewhere along the aforementioned continuum or spectrum. As noted by Collis and Hussey (2009, p. 57) “few researchers now adopt the pure forms of the main paradigms”. It is also interesting to note that there are differing

views about the relative commensurability of the paradigms (as noted by Bryman and Bell 2003, p. 23). Easterby-Smith et al. (2008), for example, note the trend from positivism to interpretivism in social sciences research since the early 1980s. Robson (2002) puts the debate between the two positions into sharp focus:

This solution to the so-called ‘paradigm wars’ endemic in the social sciences for the past three decades between positivists (empiricists, quantitative researchers) and constructionists (phenomonologists, qualitative researchers) calls for a radical reappraisal by warriors on both sides of the divide. (p. 43)

### ***3.2.6 Towards a Multi-Paradigmatic Position?***

Bryman and Bell (2003), in their discussion of the relative merits of the two “pure” positions note that:

The point being made here is that quantitative and qualitative research represent different research strategies and that each carries with it striking differences in terms of the role of theory, epistemological issues and ontological concerns. However, the distinction is not a hard-and-fast one: studies that have the broad characteristics of one may have a characteristic of the other (p. 26).

Similarly, Guba and Lincoln (1994) state that “both qualitative and quantitative methods may be used appropriately with any research paradigm” (p. 105) and Easterby-Smith et al. (2008) that “research problems (in management) often require eclectic designs which draw on more than one tradition” (p. 56). However, these assertions are straying into the realm of research design and choice of methodology, rather than being purely rooted in the debate about philosophy.

Nonetheless, and perhaps most strikingly, Bryman (1988) points out that in practice there is a greater rapprochement between workers in the two traditions than would appear to be the case from studying their philosophical underpinnings, and hence a greater compatibility of approach in practice. This is probably particularly true in applied areas. Logistics and SCM could be regarded as such an “applied area” and there is evidence that this “rapprochement” is finding favour with scholars in the field. The foregoing raises questions about the legitimacy of two other approaches – *realism* and *pragmatism*.

As noted in section 3.2.3, positivism has its roots in the branch of philosophy known as realism<sup>25</sup>. Robson (2002) proposes an approach to “real-world” research based on this paradigm and, in particular, the variant known as critical realism. He suggests that “realism permits a new integration of what are usually referred to as subjectivist and objectivist approaches” (p. 35). It is usually regarded as lying at the midpoint of the lower horizontal axis in the Burrell and Morgan matrix shown in Figure 3.2 (above). Robson’s argument is that real-world research needs to retain the advantages of positivism by ensuring that a “scientific attitude” is adopted. In this context a “scientific attitude” requires that research be carried out systematically, sceptically and ethically. However, he goes on to assert that “it is the ‘standard’ positivist, scientific view which is wrong” and that:

rather than throw the scientific baby out with the positivist bath water, perhaps one can nurture this frail infant by re-conceptualising the view of science so that it provides a more adequate representation of what scientists do and a more promising basis for social sciences (p. 21-22).

The essence of this approach, based largely on the work of Roy Bhaskar and Rom Harré, is that the *outcome* of an *action* follows from *mechanisms* acting in particular *contexts*.

Curran and Blackburn (2001) argue that the pluralist approach (i.e. pragmatism) is an attempt to “cross the divide between the quantitative and qualitative and the positivist and non-positivist” (p. 123). As noted by Saunders et al. (2009), pragmatism involves adopting ontological, epistemological and axiological approaches as determined by the research question. In other words, a particular approach may be more appropriate for answering particular questions. As they succinctly put it:

If the research question does not suggest unambiguously that either a positivist or interpretivist philosophy is adopted, this confirms the pragmatist’s view that it is perfectly possible to work with variations in your epistemology, ontology and axiology (p. 109).

Another way of describing the pragmatic position is that the truth is “what works”. Robson (2002) argues that “pragmatism is itself a philosophical position with a respectable, mainly American, history going back to the work of Charles Sanders Peirce, William James and John Dewey” (p. 43).

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<sup>25</sup> Many labels exist, including scientific realism, critical realism, fallibilistic realism, subtle realism and transcendental realism.

In any case, it is important that researchers recognise the importance of philosophical positionality and paradigmatic preferences for a variety of reasons. For example, Easterby-Smith et al. (2008) suggest that:

Failure to think through philosophical issues such as this (the relationship between data and theory), while not necessarily fatal, can seriously affect the quality of management research, and they are central to the notion of research design (p. 56).

In a similar vein, Johnson and Clark (2006) argue that the important issue is not so much whether our research should be philosophically informed, but it is how well we are able to reflect upon our philosophical choices and defend them in relation to the alternatives we could have adopted. Morgan and Smircich (1980), in a point reiterated by Mangan et al. (2004), suggest that researchers often fail to effectively communicate with each other as a result of the varying assumptions they hold about their subject.

### ***3.2.7 Paradigmatic Preferences and Positionality in this Research***

As noted by Mangan et al. (2004) “the majority of logistics research is, rightly or wrongly, primarily populated by quantitative research viewed through a positivist lens” (p. 575). This assertion is borne out by the reviews carried out by Dunn et al. (1994), Mentzer and Kahn (1995) and Samuel (1997) in the 1990s, and more recently by Sachan and Datta (2005), Frankel et al. (2005) and Spens and Kovacs (2006). For example, Sachan and Datta (2005) report that of the papers published in the *Journal of Business Logistics, Supply Chain Management: an International Journal* and the *International Journal of Physical Distribution and Logistics Management* between 1999 and 2003, the majority (over 60%) make exclusive use of research methods associated with the positivist paradigm (surveys, simulation and mathematical modeling). However, there is some evidence that the extent to which methods associated with the interpretivist paradigm are being used in logistics and SCM research is increasing<sup>26</sup>.

Mangan et al. (2004) in considering the appropriateness of the two paradigms with reference to logistics decision making note that:

It could be suggested that positivism is relevant for getting an overview and for considering the broad structure of decisions, whereas phenomenology (i.e.

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<sup>26</sup> For example, Mentzer and Kahn’s (1995) paper reviewed all of the papers published in the *Journal of Business Logistics* between 1978 and 1993 and found that just 3.2% had used a case study approach; Sachan and Datta (2005) reported that 16.1% of papers used this method.

interpretivism) is useful for finding out at the micro-level about the behaviour of the decision maker (p. 568).

This mirrors a comment made by New and Payne (1995) almost a decade earlier, albeit using slightly different language:

The most striking conclusion is that while logistics is a difficult area for relevant empirical research, progress may be possible if the range of methodologies employed expands to match the greater scope of the holistic interpretations of logistics. “Soft” data – such as managers’ expectations or fears concerning the behaviour of suppliers and customers – is as important as data on stock turns or delivery patterns. This presents a considerable challenge to a predominantly technical field (p. 74-75).

Both papers are suggesting a role for multi-paradigmatic positions, and the consequential use of methodologically pluralist approaches, to enrich and develop logistics and SCM understanding.

Amongst the recommendations of Sachan and Datta (2005) is an increased focus on the use of “behavioral research methods” to develop new insights into what we know about contemporary supply chains. They also note that as a result of the dominance of positivist approaches research in the discipline “is not able to look at the system holistically” (p. 675). Other authors – notably Naslund (2002) – have also called for more research based on the interpretivist rather than the purely positivist paradigm. Frankel et al. (2005) suggest that “good research is good research” and that:

It is important that in an evolving and applied field such as logistics that we utilize multiple kinds of good research. In other words, researchers must provide good examples of the application of different paradigms and methods. The key to making that condition a reality is to understand, appreciate, and encourage a diversity of perspectives and methods (p. 205).

This reinforces the points made above in relation to the need for multi-paradigmatic approaches in logistics and SCM research.

In relation to the research described in this thesis, answering the research questions requires that a range of insights be generated by viewing the research problem through different philosophical perspectives. This helps to ensure that the issues being studied are explored holistically and that the disadvantages associated with the adoption of purely positivist or interpretivist positions are avoided. This in turn drives the



methodological approach adopted, i.e. one which explores the research questions through an appropriate combination of quantitative and qualitative methods.

### **3.3 Research Methodology**

Research methodology is defined by Collis and Hussey (2009) as “an approach to the process of the research encompassing a body of methods” (p. 337). According to Saunders et al. (2009) choice of research methodology is guided by a number of factors. These include:

- The research question and objectives;
- The researcher’s existing knowledge;
- The amount of time and resources available; and,
- The researcher’s philosophical underpinnings.

In any case, there are a wide variety of different possible methodologies and choosing between them is the critical issue. It should be noted that these methodologies are not mutually exclusive, i.e. a mix of strategies may be appropriate in seeking to answer a particular research question or a set of related research questions. It should also be noted that the process of *research design* involves deciding on the strategic approach to be adopted and on which data collection and analysis techniques are most appropriate.

This section sets out the features of two main approaches to research (induction and deduction, associated with the positivist and interpretivist positions respectively). It goes on to discuss the distinction between quantitative and qualitative research (again broadly associated with the positivist and interpretivist schools respectively). The possible use of methodological pluralism in the context of triangulation is proposed as a means of integrating the strengths and mitigating the shortcomings of quantitative and qualitative methods. This section goes on to describe the characteristics of a number of research methodologies which have varying degrees of appropriateness in answering the research questions posed in this thesis. The specific methodologies discussed are case studies, action research and grounded theory. The section concludes with an overview of the broad methodological approach to be adopted in answering the questions set out in Chapter 2.

### 3.3.1 Research Approaches: Induction and Deduction

Scholars have long distinguished between inductive and deductive research (see Figure 3.3). Using the inductive approach, generalisations are made on the basis of particular data that have been observed. According to Glaser and Strauss (1967), such approaches reveal the real features of the examined phenomenon “a posteriori” as theory is an outcome of the research process (i.e. “theory building”). This is the opposite of the deductive approach, where observations and findings are used to test the “a priori” assumptions of research (i.e. “theory testing”).

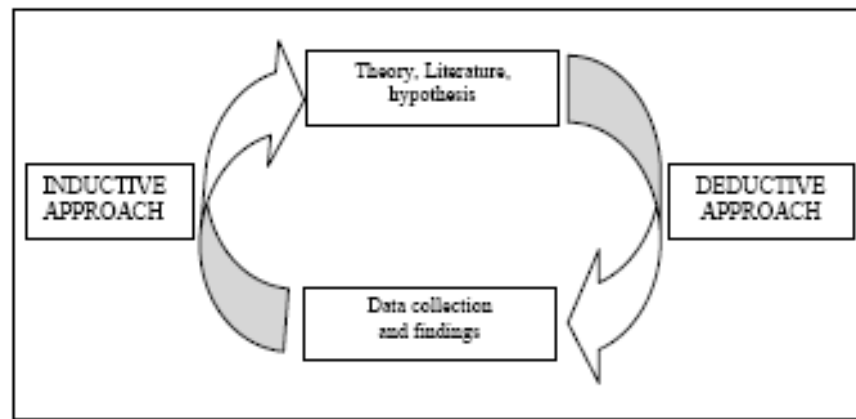


Figure 3.3: Inductive and Deductive Research Approaches

As noted in section 3.2.5 and illustrated in Table 3.1, the development and testing of hypotheses and theory deductively is a characteristic of the positivist paradigm. Interpretivists, on the other hand, try to build theory inductively. In line with the multi-paradigmatic position adopted in this research, the research design is based on the effective simultaneous use of inductive and deductive approaches. This is discussed in detail in section 3.5.

### 3.3.2 Quantitative versus Qualitative Research

Many authors on methodological issues have discussed the distinction between two fundamental strategies to studying business and other phenomena: the quantitative and the qualitative strategy (see, for example: Martin, 1990; Hammersley, 1999; Denzin and Lincoln, 2000). The distinction between the two methods gave rise to a debate concerning their relative merits – one that in many ways mirrors the debate between positivists and interpretivists. Nevertheless, the quantitative/qualitative distinction still represents a useful way of classifying different business research strategies (Bryman and Bell, 2003).

In general, quantitative research is a research strategy that primarily seeks to emphasise quantification in the collection and analysis of data, while qualitative research can be considered a research strategy that usually emphasises words rather than quantification in the collection and analysis of data. Generally, quantitative research involves the statistical analysis of experimental, survey, archival and other data. The aim of quantitative inquiry is to identify common patterns or processes characterising an examined population and to derive explanations of cause-and-effect relationships. In the context of a quantitative approach, the subject of the research process (i.e. the researcher) is seen as a separate, distant entity from the object of investigation (Dachler, 1997). Quantitative research tends to adopt a rigid, structured approach: for example, survey research is structured in the sense that sampling and questionnaire construction are conducted prior to the start of data collection and then imposed on the sample members. Data obtained from quantitative research are often depicted as hard, rigorous and reliable. Since quantitative studies usually embrace a multitude of variables for a large population, the large amount of resulting data has to be analysed by means of statistical procedures to derive relevant information. There are certain general strengths associated with the use of quantitative strategies. The first is that the use of statistically representative sampling techniques allows for generalisation of findings to the entire population (Scandura and Williams, 2000). The application of statistical procedures makes it possible to examine relatively large samples. In addition, researchers can easily replicate quantitative studies to corroborate or disprove previous evidence. One of the main weaknesses in quantitative research is related to the fact that in many cases, complex real situations cannot be simply reduced to numbers (Bentz and Shapiro, 1998).

Qualitative research, on the other hand, tends to emphasise processes and meanings that are not experimentally examined or measured in terms of quantity, amount, intensity or frequency (Denzin and Lincoln, 2000). Qualitative research involves the use of largely non-mathematical analytical procedures that result in findings derived from data gathered mainly through observation and interviews, but also through conversation, books, documents and recordings. The aim of qualitative strategies is to understand and interpret social phenomena in their real-life contexts. Therefore, qualitative researchers investigate subjects in their natural settings attempting to make sense of phenomena in terms of the meanings people bring to them (Denzin and Lincoln, 2000). Qualitative

research tends to be flexible and open: data collection times and methods can be varied as a study proceeds. The data obtained from qualitative analysis are usually described as rich and deep conceptualisations of the social world (Denzin and Lincoln, 2000). Qualitative research approaches have certain general strengths and weaknesses. A strength of qualitative research can be found in the richness of data and the depth of inquiry. This derives from the focus on events in natural settings and the flexibility afforded by qualitative studies. However, as the time and effort involved in qualitative research makes the in-depth examination of large numbers of situations difficult, the generalisation of findings to entire populations is often questionable (Martin, 1990). In addition, qualitative methods are more susceptible to researcher bias and reliability problems (Snow and Thomas, 1994).

### ***3.3.3 Combining Qualitative and Quantitative Strategies***

In the academic debate on research methodology, the use of combinatory methodological approaches is being increasingly emphasised as an option for integrating the strengths and mitigating the shortcomings of quantitative and qualitative methods. In fact, the traditional demarcation between quantitative and qualitative approaches tends to underestimate the complexity of contemporary research problems (Hammersley, 1999). The use of each approach in isolation tends to give only a particular perspective. By contrast, the use of quantitative and qualitative methods in combination may provide deeper insights as well as broadening the research perspective. In this way, the use of multiple research approaches in combination may provide valuable contributions to addressing the same research problem (Bartunek et al., 1993). As noted by Bickman and Rog (1998), these multiple approaches – cutting across quantitative and qualitative boundaries – are often needed to examine a topic thoroughly and to provide substantial results. This is in line with the concept of *triangulation*.

The term triangulation originates from navigation and military strategy and refers to the use of multiple geographical reference points to locate an object's exact position (Jick, 1979). Easterby-Smith et al. (2008) identify four different types of triangulation:

1. *data triangulation*, where data are collected at different times or from different sources;
2. *investigator (or observer) triangulation*, where different investigators independently collect data;

3. *methodological triangulation*, where both quantitative and qualitative techniques are employed; and,
4. *theory triangulation* (or *triangulation of theories*), where a theory is taken from one discipline and used to explain a phenomenon in another discipline.

In the context of research methodology it is methodological triangulation, and to a lesser extent data triangulation, which is arguably of most significance. The rationale for triangulation relies upon the idea that the particular limitations of a given method will be compensated by the counter-balancing strengths of another (Jick, 1979). Using several data sources and measures of phenomena provides cross-checks on data accuracy and enrichment of the conclusions researchers might reach (Harrigan, 1983). However, a triangulation strategy has weaknesses. Firstly, replicating a mixed methods package is often a nearly impossible task (Jick, 1979). Secondly, if the research is not clearly focused conceptually or theoretically, even the most sophisticated combination of methods will not produce satisfactory results. Thirdly, the researcher needs to be trained in multiple methods and has to cope with various constraints in terms of time and cost (Martin, 1990).

### **3.3.4 Case Studies**

The use of a case study methodology is recognized as an effective means of collecting in-depth information and can, therefore, complement the use of more quantitative approaches such as questionnaire surveys (Voss et al., 2002). The main advantage of the case study methodology is that the researcher can develop a detailed (i.e. deep and rich) understanding of the case under consideration. However, the case study as a method relies heavily on the perceptions, opinions, and perspectives of respondents and is hence susceptible to response bias (Yin, 1998).

The use of case studies in SCM research has increased in recent years. Nevertheless, the need for more case study analysis in the field has been emphasised by several scholars. Chow et al. (1994), as a result of some of the inherent limitations of survey-based research, invited journal editors to encourage case study methods in logistics and SCM research. Ellram (1996) observed that the case study method is not well understood particularly in the field of purchasing and logistics management research. Meredith (1998) noted that case study methods continue to be rarely used in operations and logistics management and documented the advantages and rigour of case study research. Gammelgaard (2003), noting the lack of case approaches in logistics research, analysed

a selection of 17 case studies from leading logistics/SCM journals to derive a framework for understanding and conducting case analysis. She pointed out that to increase the value for logistics research it is important to choose an appropriate strategy for case study analysis. Finally, Juga (2003) argued that if case studies in logistics research are built on solid theoretical bases they can be considered a valuable tool in stimulating the dialogue between practitioners and academics and in promoting improvement in logistics competencies.

### ***3.3.5 Action Research***

The first use of the phrase “action research” is usually attributed to Karl Lewin of MIT in 1946 (Lewin, 1946). Easterby-Smith et al. (2008) define it as “an approach to research which seeks understanding through attempting to change the situation under investigation.” (p. 326). The term and concept have been used by management researchers in a variety of ways over the years. Coghlan and Brannick (2005) suggest that action research is research in action rather than research about action. In other words, the research focuses on the resolution of organisational issues. Sometimes, the term is used where practitioners are involved in some way in the research, in particular where practitioners and researchers work in a collaborative manner. Eden and Huxham (1996, p. 75) capture this approach to action research very effectively when they describe it as being about “involvement [by researchers] with members of an organisation over a matter which is of genuine concern to them”. In other words, the researcher becomes part of the organisation in which the research is being carried. This is very much in line with the epistemological stance adopted in the interpretivist paradigm. A common approach to action research going right back to Lewin’s work in the 1940s involves the concept of a “spiral” such as that illustrated in Figure 3.4.

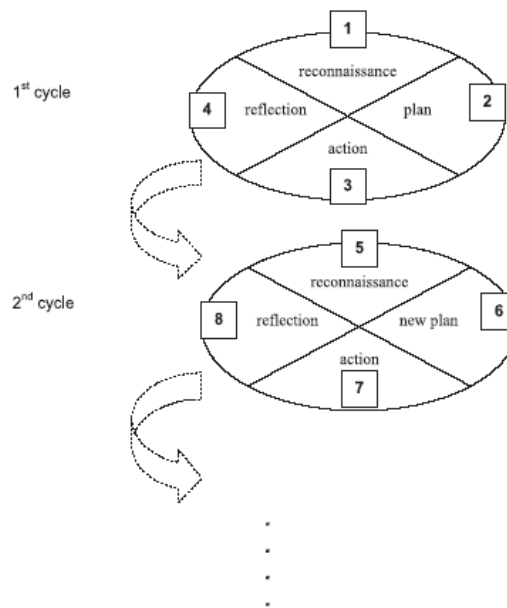


Figure 3.4: Action Research “Spiral”  
Modified from Lewin (1946)

The essence of the spiral is that action research is an iterative process. The process involves a number of cycles of *reconnaissance* (or *diagnosis* or *fact finding and analysis*), *planning* and *taking action*. At the end of each cycle, there is a period of *reflection*, followed by additional reconnaissance leading to a new plan, along with the necessary action to implement the new plan.

### 3.3.6 Grounded Theory<sup>27</sup>

Grounded theory was developed by Barney G. Glaser and Anselm L. Strauss in the 1960s (Glaser and Strauss, 1967), their book described by Bryman and Bell (2003) as “one of the most widely cited books in the social sciences” (p. 427). Saunders et al. (2009) describe grounded theory as a “research strategy in which theory is developed from data generated by a series of observations or interviews principally involving an inductive approach” (p. 593); Collis and Hussey (2009) describe it as “a methodology in which a systematic set of procedures is used to develop an inductively derived theory about a phenomenon”. The *systematic set of procedures* referred to is the approach set out in Glaser and Strauss (1967). However, providing an accurate description of grounded theory is difficult as many researchers have deviated considerably from the original – and quite prescriptive – Glaser and Strauss approach. Furthermore, as noted by Mangan et al. (2004), the phrase is now often used as a generic one for a variety of

<sup>27</sup> Mello and Flint (2009) provide a useful overview of the background, objectives, and methodological issues of grounded theory in a logistics context “in order to better prepare researchers for some of the decisions they need to make when entering into a study” (p. 122).

theory-building approaches that do not closely follow the original methodology. Nonetheless, Collis and Hussey (2009) provide a very succinct description that captures the essence of the approach:

The theoretical framework is developed by the researcher alternating between inductive and deductive thought. Firstly, the researcher inductively gains information that is apparent in the research data. Next, a deductive approach is used to allow the researcher to turn away from the data, think rationally about the missing information and form logical conclusions. When conclusions have been drawn, the researcher reverts to an inductive approach and tests these tentative hypotheses with existing or new data. By returning to the data, the deduced suggestions can be supported, refuted or modified. Then supported or modified suggestions can be used to form hypotheses and investigated more fully. It is this inductive/deductive approach and the constant reference to the data that helps ground the theory (p. 157).

Thus, the approach is an iterative (or recursive) one in the sense that data collection and analysis proceed in tandem, repeatedly referring back to each other. This inductive/deductive approach and the constant reference back to the data helps to “ground” the theory (Bryman and Bell, 2003).

Bryman and Bell (2003) state that grounded theory “has become by far the most widely used framework for analysing qualitative data” (p. 427). However, a note of caution is sounded by Easterby-Smith et al. (2008):

It is important to note that ‘I’m doing grounded theory’, should not be used as a justification for doing some vaguely qualitative research without any clear view of where it is supposed to lead. Grounded theory contains precisely articulated methods and presuppositions (p. 101).

However, these “precisely articulated methods and presuppositions” can result in the process becoming, as observed by Mangan et al. (2004), “somewhat complex” (p. 576) and prescriptive.

### ***3.3.7 Methodology in this Research: Methodological Pluralism***

The overall methodology to be adopted in the research described in this thesis is based on *methodological pluralism*. The choice of such an approach allows a clearer and more detailed picture of the phenomena being investigated to be developed.



However, it is important to emphasise that the use of multiple-method approaches based on the triangulation principle is not in itself what methodological pluralism is about. Rather, it is concerned with the effective use of a range of appropriate methods as part of an integrated research design. The various methodological approaches need to complement each other as integral elements of a cohesive overall strategy. In this way, the dangers of *naïve empiricism* are minimized. Naïve empiricism is a term which is often used to indicate fact-finding without any reference to the theoretical underpinnings of a subject. As noted by Bryman and Bell (2003), some “fact-finding exercises” should not be dismissed prematurely as naïve empiricism. This point is relevant to the current research as:

1. The extent to which SCM practices have been adopted by firms in Ireland is of interest in itself, given their potentially important role in the improving competitiveness of firms; and,
2. As noted in section 2.6, there is no “unified theory” of SCM or logistics.

Furthermore, it is proposed that the RQs posed in this thesis will be addressed using the *Four Fundamentals* construct as a frame of reference. This construct has itself been developed based on a detailed review of the existing body of SCM knowledge (see Chapter 2). This, and the adoption of combinatory methodological approaches, is aimed at ensuring that the work described in this thesis:

1. Is of practical value to practitioners and policy-makers by providing a detailed understanding of the current SCM landscape in Ireland; and,
2. Contributes in a meaningful way to the further development of critical SCM theory across the range of domains addressed.

Thus, and as highlighted earlier, this research is not simply an exercise in fact-finding in an Irish context; it also seeks to support the building and testing of SCM theory.

As noted in section 3.3.1, inductive research is largely concerned with theory building, while deductive research is primarily focused on theory testing. A further important feature of the research design in this project is its emphasis on the effective simultaneous use of inductive and deductive approaches. There is no reason why these approaches should be seen in any way as mutually exclusive. On the basis of their analysis, Croom et al. (2000) stated that “we feel that the inductive/deductive dichotomy is best addressed through the constant reflection of empirical against theoretical studies.” (p.75). However, few scholars have adopted this advice with the great majority of studies continuing to fall into the deduction (or “empirical-

descriptive”) category. However, the work of Storey et al. (2006) stated in relation to their case-based research design that, “This kind of dual theoretical and empirical approach is in tune with the point made by Croom et al. (2000)” (p. 763). Indeed, some of the principles of the grounded theory methodology (see section 3.3.6) are in evidence here in that the approach adopted is an iterative (or recursive) one with data collection and analysis carried out in tandem, repeatedly referring back to each other. The effective use of case studies has the potential to generate insights into some of the RQs posited by the author. However, the disadvantages associated with this methodology, particularly in relation to identification of appropriate case companies and generalisability of findings, are such that its value as part of the author’s research design is somewhat limited. Similarly, while the action research concept of the researcher working collaboratively with practitioners is relevant in this context, its specific focus on understanding the implications of change is such that its value in the current research is quite restricted.

### **3.4 Research Methods and Techniques**

It was noted in section 3.3 that research methodology is as “an approach to the process of the research encompassing a body of methods” (Collis and Hussey, 2009, p. 337). In this context, the use of combinatory (i.e. mixed-methods) approaches is being increasingly emphasised as an option for integrating the strengths and mitigating the shortcomings of various quantitative and qualitative techniques – the essence of methodological triangulation. In order to explore the specific questions posed in this thesis, an appropriate research design should adopt a variety of empirical methods and techniques to enable a comprehensive coverage of the issues being investigated. Therefore, and as discussed in section 3.3.7, a multiple-method approach in the form of *triangulation* provides the methodological basis for the empirical part of this thesis. The following sections describe four methods or techniques each of which has potential in addressing the research questions posed in this thesis – surveys, focussed interviews, focus groups and ethnography.

#### **3.4.1 Surveys**

In line with its largely positivist tradition, questionnaire surveys have been widely used in SCM and other business research for many decades and continue to play a key role. There are several reasons for the widespread use of this technique.

Firstly, a survey's prime advantage is its efficiency in terms of speed and cost in generating large amounts of data that can be subjected to statistical analysis (Snow and Thomas, 1994). Surveys allow for large numbers of respondents to be surveyed even if the respondents are widely distributed geographically (Mangione, 1998). Survey research is especially well suited for answering questions concerning "what is happening?" (Pinsonneault and Kraemer, 1993). Moreover, surveys are particularly useful when the research goal is to provide a description of the incidence or prevalence of a phenomenon (Yin, 1994). In addition, surveys have inherent advantages compared to other methods in that they allow respondents to answer questions at times that are convenient, to see the context of a series of questions, to take time in answering, and to look up information as required (Mangione, 1998). Furthermore, in comparison to other data collection methods (e.g. interviews – see section 3.4.2), the use of the survey method eliminates interviewer bias.

Not surprisingly, as with each empirical method, surveys have potential weaknesses: one major limitation is their typically low response rate. Low response rates are problematic because they reduce confidence concerning the extent to which survey findings can be generalised to the entire population from which the survey is drawn (Snow and Thomas, 1994). Another potential problem area relates to response errors due to ambiguous wording and lack of interactivity (Mangione, 1998). Attention to detail in questionnaire design and testing is critical if the impact of this potential problem area is to be minimized.

### ***3.4.2 Focussed Interviews***

The purpose of interviews is not to conclusively test hypotheses but to help the researcher understand the experiences of the interviewees. In-depth qualitative interviews are most appropriately used when a rich, detailed, holistic picture is needed of people's experience and how they interpret it, and when the study is exploratory in nature. Traditionally, a number of different interviewing approaches have been used in research (Merton et al, 1990; Collis and Hussey, 2009).

A **structured interview**, sometimes called a standardized interview, involves the administration of an interview schedule by an interviewer. The main aim is for all interviewees to be given exactly the same context of questioning. This is to ensure that

replies can be aggregated – this can only be reliably achieved if all replies are given in response to identical cues. Questions are usually very specific and often offer respondents a fixed range of answers (i.e. closed questions).

An **unstructured interview** is similar in many ways to a conversation. The interviewer, often using at most an aide-memoire as a set of prompts, allows the interviewee to respond freely. The interviewer responds to points deemed worthy of follow-up. An unstructured interview may be based on just a single question.

Both structured and unstructured interviews have advantages and disadvantages. A **focussed (or semi-structured) interview** is an attempt to combine the advantages of both. In this case the interviewer has a list of questions on fairly specific topics to be covered (an interview guide) but allows the interviewee some latitude in how questions are answered. Interviewers may deviate from the precise questions in the guide based on responses given by the interviewee. For example, the order in which questions are asked may vary and questions not included in the guide may be asked.

### ***3.4.3 Focus Groups***

The focus group is essentially a structured group process used to obtain detailed information about a particular topic. Bryman and Bell (2003, p. 368) defines the focus group method as:

a form of group interview in which: there are several participants (in addition to the moderator/facilitator); there is an emphasis on questioning on a particular fairly tightly defined topic; and, the accent is upon interaction within the group and the joint construction of meaning.

The focus group is particularly useful for exploring a specific theme or topic in depth and for drawing out precise issues that may be unknown to the researcher. It allows elements of two other methods (i.e. group interviews and focussed interviews) to be combined. As focus group discussion involves people probing each other's reasons for holding a certain view, the researcher is able to obtain a more realistic perspective on a particular topic.

The number of participants involved in a focus group discussion will vary. Generally, it ranges from six to ten participants who are brought together to discuss a clearly defined topic (Morgan, 1998). Typically, focus groups have a homogeneous composition, all

representing a particular segment of the population. A group moderator/facilitator keeps the discussion on track by asking a series of open-ended questions designed to stimulate discussion. This creates the potential to explore topics in detail and to draw out precise issues that may be unknown to the researcher. As a result, the use of this method may provide several advantages, but there are also a number of limitations.

The main advantages associated with the use of the focus group method are as follows:

- a focus group can generate a large amount of data in a short period of time and the findings may be used to precede quantitative techniques (Morgan, 1998);
- social interaction in a focus group environment can produce new insights into the topic investigated. It enables the researcher to learn or confirm not just the facts (as in survey methods) but the meaning behind the facts (Krueger and Casey, 2000);
- a focus group can be a more flexible technique in comparison with the use of surveys. In a focus group discussion, the researcher can probe for clarification and solicit greater detail (McDonald, 1993); and,
- focus groups are relatively easy to undertake and are relatively cost-effective (Bryman and Bell, 2003).

Nevertheless, the focus group method has a number of limitations that may affect its research potential:

- a focus group may provide useful data that lead to important insights in relation to the topic under investigation, but they are not set up to generalise in the same way as survey research (Fern, 2001). In other words, because the group is generally hand-selected, the results may not be representative of the general population (Morgan, 1998);
- the researcher has less control over the process than in other qualitative techniques such as individual interviews (Bryman and Bell, 2003);
- there are a number of circumstances in which focus groups may be inappropriate. For example, Madriz (2000) argues that when participants are not comfortable in each other's presence or when participants are likely to disagree profoundly with each other, this may cause biased responses;
- a focus group is often difficult to assemble and it requires a highly skilled moderator (Bryman and Bell, 2003); and,

- the large amount of data produced by focus groups can be difficult to analyse and transcription is generally more time-consuming than with individual interviews (Bryman and Bell, 2003).

The focus group method is a well established technique in various fields of social research such as psychology and human resources. The method has also been applied in management and business research, in particular in marketing, and there is a substantial body of literature dealing with focus group implementation in this field (for example: Fern, 2001; McDonald, 1993; Calder, 1977).

To maximize the benefits of using a focus group, identification of a skilled moderator is of critical importance. This moderator creates an environment in which the participants who do not know each other feel relaxed and encouraged to exchange views and ideas about the topic being investigated. In terms of participant selection, most scholars (e.g. Krueger and Casey, 2000) recommend that participants should not know each other, thus encouraging a more honest and spontaneous expression of views and a wider range of responses. It also helps to prevent set behaviours relating to pre-existing relationships and patterns of leadership in the group (Thomas et al., 1995).

#### ***3.4.4 Ethnography and Participant Observation***

Saunders et al. (2009) describe ethnography as a “research strategy that focuses upon describing and interpreting the social world through first-hand field study” (p. 591). According to Collis and Hussey (2008) it is a “methodology in which the researcher uses socially acquired and shared knowledge to understand the observed patterns of human activity” (p. 79). The main method of data collection is *participant observation*. Indeed, as noted by Bryman and Bell (2003) the term “ethnography” and the phrase “participant observation” are often used interchangeably and it is difficult to distinguish between many definitions of these terms. They also (2003) state that:

It is possible that the term ‘ethnography’ is sometimes preferred because ‘participant observation’ seems to imply just observation, though in practice participant observers do more than simply observe (p. 316).

In any case, all definitions note the fact that the ethnographer immerses him/herself in a group for an extended period of time. During this time, he/she observes the behaviour of participants, noting what is said in conversations, and asking questions as appropriate. As such, ethnography tends to be used by researchers from the interpretivist tradition.

The approach lends itself to the generation of deep and rich knowledge about specific situations and phenomena. However, as with all research methods, there are some potential disadvantages associated with ethnography and participant observation. Hussey and Hussey (1997), for example, cite a variety of problems with the technique. A key issue is that of generalisability, i.e. whether it is possible to generalise from specific cases of participant observation.

#### ***3.4.5 Research Methods and Techniques Used in this Research***

New and Payne (1995) suggested that in the field of empirical research in logistics and SCM, significant progress can be achieved through expanding the range of methods employed. They went on to propose a model based on case studies combined with surveys as a way of extending the explanatory power of the case approach to a wider range of organisations. Since then, several other logistics and SCM scholars have made similar suggestions with, in particular, many calls for more qualitative studies to generate deeper and richer understandings of key phenomena (see, for example: Seuring, 2005; Sachan and Datta, 2005; Mangan et al., 2004). Eisenhardt (1989) argued that qualitative data allow:

1. better understanding of quantitative data; and,
2. improvements in the interpretation of relationships revealed by survey data analysis.

In this thesis, information generated by focussed interviews and focus groups will have this function as they will be used in combination with survey data.

The author's analysis of the methodological approaches used in previous empirical research in the SCM field reveals a strong emphasis on the use of single-method approaches (see Appendix 7)<sup>28</sup>, with the great majority of studies making exclusive use of questionnaire surveys. The advantages of the latter are such that they will play a key role in the current research. However, the value of the proposed survey will be enhanced by using it in conjunction with a range of other, more qualitative, methods.

The following sections discuss the specific research methods and techniques to be used in this research with a particular emphasis on the role of each in the context of the

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<sup>28</sup> This mirrors the reviews carried out by Dunn et al. (1994), Mentzer and Kahn (1995) and Samuel (1997) in the 1990s, and more recently by Sachan and Datta (2005), Frankel et al. (2005) and Spens and Kovacs (2006).

overall combinatory methodological approach, i.e. in the context of methodological pluralism.

### Surveys

As discussed earlier, notwithstanding some of the limitations associated with their use, the prime advantage of surveys is their efficiency in terms of speed and cost in generating large amounts of data that can be subjected to statistical analysis (Snow and Thomas, 1994). As survey research is especially well suited for answering questions concerning “what is happening?” (Pinsonneault and Kraemer, 1993), it provides an efficient means of investigating levels of SCM adoption. Moreover (and as noted earlier), surveys are particularly useful when the research goal is to provide a description of the incidence or prevalence of a phenomenon (Yin, 1994). This is in line with some of the overall research questions being explored – in particular RQ2 – in this thesis. For these and other reasons, use of a survey – as one element of an overall mixed-method approach – provides a potentially efficient means of investigating many of the issues and questions under consideration. Furthermore, in comparison to other (more qualitative) data collection methods, the use of the survey method eliminates interviewer bias.

### Focussed Interviews

As noted in section 3.4.2, the purpose of an interview in research is to help the researcher understand the experiences of the interviewees. As such, it has potential in this project. It is important to recognise that capturing a range of perspectives is in itself of value as there are few “rights and wrongs” in a real-world domain such as SCM. In other words, the researcher can generate insights by understanding the points of view of a range of practitioners, based on their experience in a variety of settings. Furthermore, in-depth qualitative interviews are most appropriately used when the study is exploratory in nature (see, for example, Schensul et al, 1999). In this context, a rich and detailed picture of people’s experience and how they interpret it is often needed. Given the exploratory nature of many of the questions which the research described in this thesis attempts to answer, interviews have a role to play as part of the overall design.

As focussed (or semi-structured) interviews attempt to combine the advantages of both structured and unstructured interviews, they represent the most effective way of gathering the information required. An element of structure ensures that all possible



dimensions of the topic in question which are of interest in the research are discussed; however, there is also an element of flexibility in the execution of the method.

Analysis of previous SCM empirical research suggests that little use has been made of focussed interviews – certainly as a research method in its own right. In the context of surveys, several authors report the use of telephone interviews as part of a predominantly quantitative methodology. For example: Auramo et al. (2005) reported the use of 48 telephone interviews; Sezen (2008) conducted face-to-face interviews with 125 managers from manufacturing companies in Turkey; Toyli et al. (2008) used a mix of a web-based questionnaire and interviews<sup>29</sup>. In the context of case study research, the use of interviews (including focussed interviews) is inevitably an important approach. For example, Storey et al. (2006) in their study of Marks and Spencer report the use of very detailed and extensive semi-structured interviews with key informants from the focal company (past and present) and their key suppliers.

### Focus Groups

In general, the trend in management research is toward the expansion of methods and approaches including more qualitative methods, often triangulated with quantitative approaches (Mangan et al., 2004). Despite the increasing use of qualitative techniques (e.g. case studies, observations and other forms of action research) in logistics and SCM research over the last few years, their overall level of acceptance remains relatively low (Naslund, 2002; Craighead et al., 2007). This is particularly true in the case of the focus group method as confirmed by the work of Frankel et al. (2005). In their review of logistics research methods the authors analysed 108 articles published in the *Journal of Business Logistics* from 1999 to 2004. They found that focus groups were used in just three of these papers. The work of Maloni and Carter (2006) and Selviaridis and Spring (2007) reveals a similar situation in relation to logistics research in the specific area of 3PL.

For the research described in this thesis, the focus group is particularly useful for exploring a specific theme in depth and for drawing out precise issues that may be unknown to the researcher. The major benefit associated with the use of this method in

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<sup>29</sup> However, the research design adopted in that study is inadequately explained in this paper.

this work is that the researcher is able to obtain a more realistic perspective on particular topics, as a result of people probing each other's reasons for holding a certain view.

### Ethnography and Participant Observation

Whilst it is not intended to use classic ethnographic methods – as applied in, for example, anthropological research (see section 3.4.4) – elements of participant observation may have a role to play as part of: (i) focus group implementation; and (albeit to a lesser extent), (ii) the execution of focussed interviews.

## **3.5 Overall Research Design**

As noted in section 3.2.7, the research described in this thesis adopts a multi-paradigmatic philosophical approach. In line with this positionality, the research methodology adopted is based on methodological pluralism and uses a mix of inductive and deductive – and quantitative and qualitative – approaches (see section 3.3.7). As set out in section 3.4.5, an appropriate mix of methods and techniques will be implemented as part of this methodologically pluralist design.

Before describing the overall research design to be adopted in this project it is worth restating the overall research questions set out in section 2.15 – these are shown in Table 3.2 (below).

<b>RQ1</b> - What is the current level of understanding of SCM in practice?
<b>RQ2</b> - What is the current level of adoption of SCM?
<b>RQ3</b> - What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?
<b>RQ4</b> - What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?

Table 3.2: Overall Research Questions

An overview of the overall research design is shown in Figure 3.5. The chosen design attempts to view the issues under consideration from a variety of perspectives. It uses a range of methods and techniques, some associated primarily with the positivist tradition and others with the interpretivist school. In this context, as Collis and Hussey (2009) noted in relation to interpretivist approaches, it should be recognised that this is an *emerging design* in that a variety of factors are being studied simultaneously and it is

expected that new issues will emerge during the research. The design comprises three phases: (i) focussed interviews; (ii) focus groups; and, (iii) a questionnaire survey. While each phase aims to address one or two of the RQs specifically as shown in Figure 3.5, the research has been designed so that all phases can potentially contribute to the generation of insights into all RQs. This is the essence of the integration concept in the context of methodological pluralism.

RQ1, with a focus on assessing the level of understanding of SCM is – by definition – largely qualitative in nature. The author believes that interviews, particularly focussed (i.e. semi-structured) interviews, are the ideal vehicle for answering this question. A series of semi-structured interviews with key informants, using the *Four Fundamentals* construct as the basis, will provide data to support the effective answering of this question. The essence of the approach will be to measure understanding of SCM by making specific reference to the *Four Fundamentals* as a definitional construct. It is proposed that additional insights will be generated using a series of focus groups comprising decision-makers from key industry sectors. This stage of the research will be largely inductive and exploratory in nature. Whilst it may not be a theory building process in the classic inductive manner, it will attempt to *build upon* an existing theory (namely the *Four Fundamentals* construct) through the development of deep and rich insights into some of its key elements.

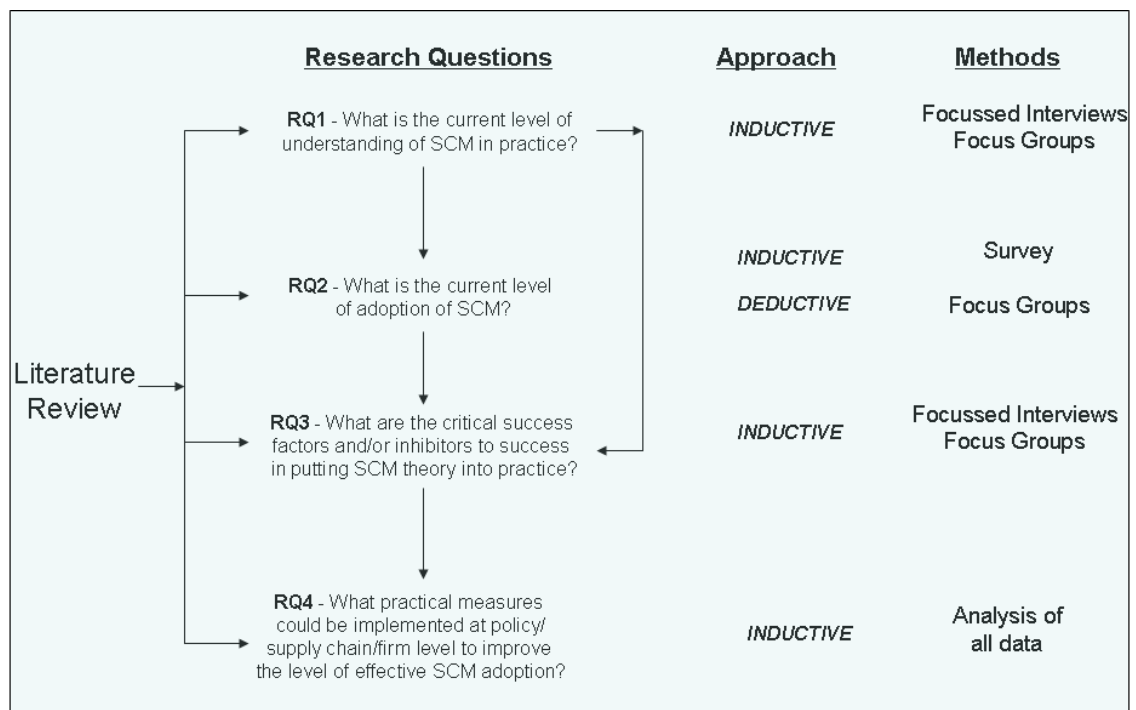


Figure 3.5: Overall Research Design

RQ2 is – by definition – more quantitative in nature. It is simply seeking to measure the level of adoption of SCM. The author's contention is that once SCM has been clearly defined this question can then be easily answered using an appropriately constructed survey questionnaire. In this case, the *Four Fundamentals* (built upon based on answering RQ1) will be the definitional construct used and the level of SCM adoption will be measured with reference to its constituent elements. This stage in the process is largely deductive in that a large volume of survey data will be used to answer a range of detailed questions, developed based on the literature and the insights generated during the first part of the research (i.e. in answering RQ1). This will be supplemented with the deeper and richer insights generated using the focus groups sessions in an inductive manner as appropriate. In this way, the research allows the exploratory research in relation to RQ1 to be built upon, but goes further by attempting to explain some of the phenomena under investigation – i.e. the research combines exploratory and explanatory dimensions.

RQ3 is again much more qualitative in nature. Whilst some general ideas may emerge from carefully constructed survey questions, it is proposed that the emphasis in answering this question will, as with RQ1, rely largely on focussed (i.e. semi-structured) interviews with key informants and on focus groups made up of decision-makers from a range of key industry sectors. Overall, the purpose with RQ3 is to inductively develop a comprehensive list of critical success factors and/or inhibitors to success using a mix of focussed interviews and focus groups.

Answering RQ4 will require a detailed analysis of all primary and secondary data collected during the project.

The following sections describe the detailed design of the focussed interviews (3.6), focus groups (3.7) and questionnaire survey (3.8) phases of the overall research design.

### **3.6 Phase I: Focussed Interviews**

#### ***3.6.1 Background***

In an effort to address an important aspect of RQ1, the author will carry out a small scale survey aimed at generating some insights into the use of the phrase *supply chain management* and the word *logistics*. This involves interviewing managers from two

third party logistics (3PL) providers / distributors, two retailers and two manufacturers, and is to a large extent a replication of the work of Lummus et al. (2001). Such replication reflects a call by Evanschitzky et al. (2007) regarding marketing studies and Neuliep (1991) regarding social science research. Evanschitzky et al. cautioned practitioners that:

scientific findings rest upon replication... few results in marketing have been successfully replicated... given these results, practitioners should be skeptical about making decisions based on the findings of the predominantly single-shot studies reported in the leading marketing journals (2007, p. 413).

It adopts the lesson of Geertz (1973, p. 5) who stated that:

If you want to understand what a science is, you should look in the first instance not at its theories or its findings. You should look at what the practitioners do.

As outlined in section 2.15.4, RQ1 asks: “What is the current level of understanding of SCM in practice?” The focus of this part of the research is on gaining deep insights into practice, particularly in relation to the fundamental issue of how practitioners define the key words and phrases. A series of semi-structured (i.e. focussed) interviews with key informants will provide data to:

- i. assess the level of understanding of practitioners, specifically in relation to the use of the phrase *supply chain management* and the word *logistics*; and,
- ii. build upon and refine the *Four Fundamentals* construct.

However, as stated by Lummus et al. (2001, p. 428-429) in relation to their study:

This is not meant to be a definitive sample, nor are we implying that the sample can be generalized to all professionals and industries. Instead, it shows examples of how the terms are currently used in industry.

The same caveats apply to the current research. Nonetheless, the research adopts a similar approach and aims to generate fresh perspectives. Specifically, the current work relates to the situation towards the end (i.e. 2009), rather than at the beginning (i.e. 2001) of the decade. The extent, if any, to which thinking has progressed is of interest. Furthermore, the context of the current work is Ireland (Lummus et al. (2001) is based on the US). The extent, if any, to which geographical differences exist is also of interest.

### **3.6.2 Data Collection**

The sample comprises two manufacturers, two third party logistics (3PL) providers / distributors and two retailers. All are based in Ireland. The first manufacturer (Manufacturer 1) is a US electronics multinational with a large production facility in

Ireland. The second (Manufacturer 2) is a large indigenous producer of food and allied products. The first 3PL (3PL1) carries out a range of warehousing, freight forwarding and other logistics services for customers across a number of sectors. The second (3PL2) is a major distributor of pharmaceutical products. The first retailer (Retailer 1) is a major department store which sells a wide range of products. The second (Retailer 2) is a small online retailer which specialises in the sale of jewellery and related products. This sample of companies handles a wide variety of product groups thus enabling the author to generate a breadth of perspectives.

Individual respondents are senior managers with responsibility for supply chain and logistics management issues. Each was sent a copy of the following three questions:

- How do you define *supply chain*?
- How do you define *logistics*?
- How are these areas (i.e. *supply chain* and *logistics*) related?

The research then involved carrying out focussed (i.e. semi-structured) interviews with each respondent<sup>30</sup>. This allowed the interviews to be based on these specific topics while providing the interviewee with some latitude in how questions are answered. Most interviews deviated from the precise questions based on responses given by the interviewee. The order in which the questions were asked varied and additional questions were asked where appropriate. This was useful as it allows issues that relate to RQ2, RQ3 and RQ4 (in addition to the core focus on RQ1) to emerge. Interviews were recorded and transcribed.

Whilst this research used Lummus et al. (2001) as its basis, it is unclear from their paper precisely what data collection approach was adopted. Their paper simply states that “each respondent was asked to reply to each question” (p. 429). Whether this was done using a simple questionnaire or through face-to-face interviews is not stated explicitly. If the former approach was adopted then the scope for exploration of some of the detailed issues of interest is clearly limited. This lack of a detailed description of the methodological approach adopted makes exact replication impossible. However, the combination in the current research of a simple questionnaire and detailed focussed

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<sup>30</sup> In addition to the specific issues raised in this section, the author was mindful of the advice provided by many scholars in relation to good practice in conducting interviews (in particular: Easterby-Smith et al., 2008; Bryman and Bell, 2003; Robson, 2002; Denzin and Lincoln, 2000; Collis and Hussey, 2009). He found Saunders et al. (2009) particularly instructive in this regard (see Chapter 10, pp. 318-359).

interviews enabled the author to collect the necessary information effectively. A detailed discussion of the findings is presented in Chapter 4.

### **3.7 Phase II: Focus Groups**

#### ***3.7.1 Background***

In essence, as noted by Bryman and Bell (2003, p. 369-70) the focus group technique provides the “opportunity to study the ways in which individuals collectively make sense of a phenomenon and construct meanings around it”. As noted earlier in this chapter, research in logistics and SCM has traditionally been based largely on the positivist paradigm with predominantly quantitative approaches adopted by researchers. In this context, in their paper on the application of the focus group method in logistics research, Sanchez Rodrigues et al. (2010, p. 77) state that:

Statistical validity is often gained, however, at the expense of a deeper understanding of attitudes, behaviour and processes, much of which requires the collection and interpretation of qualitative data.

In relation to the potential use of the focus group method in logistics and SCM research, they go on to claim that:

Logistics research is often rigorous in methodological terms but does not necessarily reflect reality, as problems need to be simplified to reduce the high level of complexity that real-world business scenarios present (p. 78).

Sanchez Rodrigues et al. (2010) also provide a useful overview of previous logistics research that involved the use of focus groups or “workshops” and classifies them “into a number of categories, reflecting the main types of research identified by Saunders et al. (2007)” (p. 78). These categories are descriptive, exploratory and explanatory – Appendix 8 shows this classification. In their concluding remarks, Sanchez Rodrigues et al. (2010, p. 90) state that:

In terms of methodological contribution, focus groups can be used to complement other methods and can add both breadth and depth to a logistics research project. A well-managed focus group discussion can very usefully supplement qualitative literature reviews or quantitative questionnaire surveys.

They refer specifically to the usefulness of the focus group method in *refining conceptual models at an early stage in a research project* – this is precisely how the method is used by the author as part of the research design in this project in relation to the *Four Fundamentals* construct.

This section describes the detailed design of the focus group component of the author's empirical work based on a generic process proposed by Sanchez Rodrigues et al. (2010) and shown in Figure 3.6 (below).

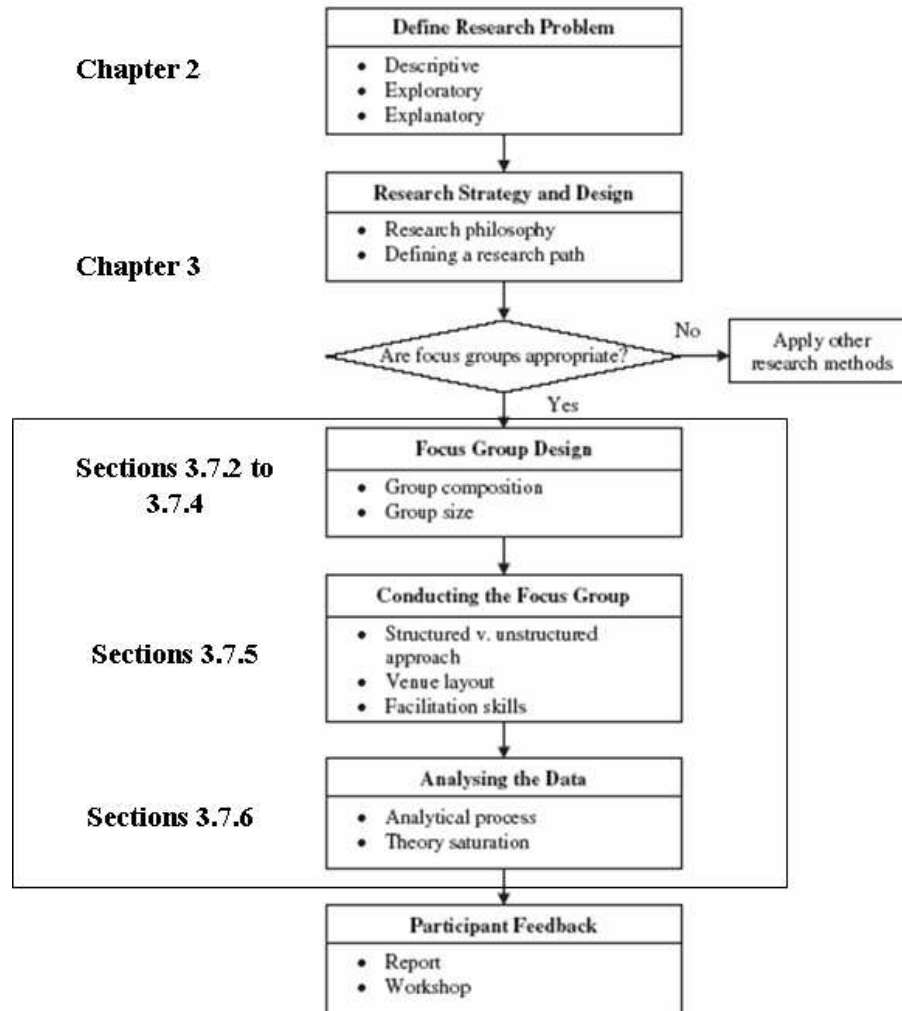


Figure 3.6: Detailed Focus Group Design Process

The following sections discuss the specific focus group design issues of group composition (3.7.2) and group size (3.7.3), followed by a summary of pertinent issues in these areas as they apply to the current research (3.7.4). Section 3.7.5 goes on to explain how the focus group sessions were conducted with specific reference to structured versus unstructured approaches, venue/layout and facilitation issues. Section 3.7.6 then sets out some of the main considerations in terms of how the data collected should be analysed.



### 3.7.2 Group Composition

In relation to focus group composition, Blackburn and Stokes (2000, p. 51) note that:

Whilst it is accepted that these focus groups can not aim to be truly representative of the population as a whole, it is important to ensure that the results could be illustrative of the possible regional and sectoral variations and therefore provide a limited level of generalizability for the results.

Their work stratified participants according to business and personal criteria, including gender, with a range of business sectors represented (including manufacturing, construction and services). In general, it is recognised that, as stated by Bryman and Bell (2003, p. 377), “a wide range of stakeholders from different organisations is required”.

Some researchers prefer to exclude people who know each other on the grounds that pre-existing styles of interaction or status differences may contaminate the session. For example, Morgan (1998) suggests that one problem with using natural groups is that people who know each other well are likely to operate with “taken-for-granted” assumptions that they feel do not need to be brought to the fore. He goes on to suggest that, if it is important for the researcher to bring out such assumptions, groups of strangers are likely to work better. Bryman and Bell (2003) suggest that a general approach to the conduct of focus group research involves the researcher navigating the channel between, on the one side, addressing the research questions and ensuring comparability between sessions, and, on the other side, allowing participants to raise issues they see as significant and in their own terms. The facilitator plays a key role in ensuring that this balance is achieved (see section 3.7.5 below).

Many scholars have distinguished between the use of *homogeneous* and *heterogeneous* groups. Table 3.3 sets out some of the main characteristics of these types of groups, with specific reference to the background, position and experience of participants.

<u>Homogeneous groups</u>	<u>Heterogeneous groups</u>
<i>Have a common background, position or experience, which</i>	<i>Differ in background, position or experience, which</i>
<ul style="list-style-type: none"> <li>• facilitates communication;</li> <li>• promotes an exchange of ideas and experiences;</li> <li>• gives a sense of security in expressing conflicts or concerns; and,</li> <li>• may result in “groupthink” (i.e. unquestioning similarity of position or views).</li> </ul>	<ul style="list-style-type: none"> <li>• can stimulate and enrich the discussion;</li> <li>• may inspire other group members to look at the topic in a different light;</li> <li>• may risk power imbalances;</li> <li>• can lead to a lack of respect for opinions expressed by some members; and,</li> <li>• can lead to some participants dominating the discussion, thus destroying the group process.</li> </ul>

Table 3.3: Characteristics of Homogeneous and Heterogeneous Focus Groups  
Based on Brown (1999) and Robson (2002)

In relation to logistics research specifically, Sanchez Rodrigues et al. (2010, p. 87) state that: “the first lesson learned is that a focus group does not just depend upon its size and composition”, despite the strong emphasis placed on these two aspects in the focus group literature. They specifically emphasized what they classified as “uncontrollable” and “controllable” factors (see Figure 3.7).

“Uncontrollable” factors relate directly to the participants; “controllable” factors are described by Sanchez Rodrigues et al. (2010, p. 87) as those “which the research team can influence”. This is a little misleading in that the research team determines the composition of the focus group and thus has a degree of control over the so-called “uncontrollables”. This is implicitly recognised in the “invitation” component of the “Design” element of the “controllable” factors. Nonetheless, the lessons elucidated by Sanchez Rodrigues et al. (2010) from their analysis of a range of logistics-based focus group research were valuable to the author in determining the composition of the focus groups, as well as in relation to the actual conduct of the groups.

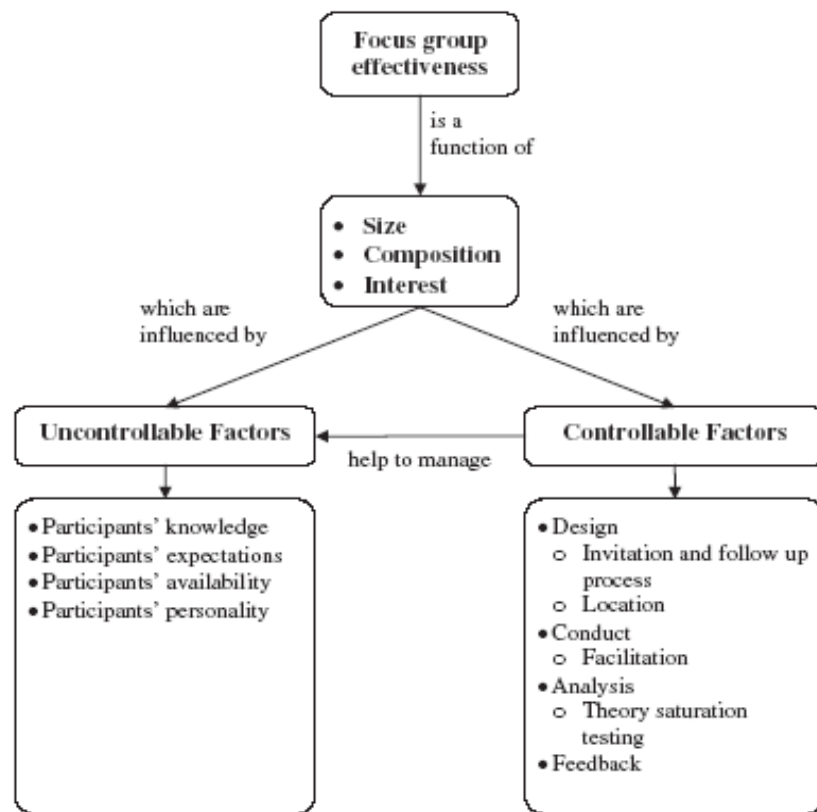


Figure 3.7: Factors Influencing Focus Group Effectiveness  
Source: Sanchez Rodrigues et al. (2010, p. 88)

In the author's research three focus groups were conducted at this stage of the project. It was considered that three were sufficient as data saturation had been reached at this point (see section 3.7.6 below). In terms of composition they represented an attempt to combine the best elements of homogeneous and heterogeneous groups. Each of the three groups was homogeneous in that all participants had extensive experience of SCM and logistics. Each of the three groups was also heterogeneous in that it comprised representatives from a range of different sectors and with a wide variety of different academic and experiential backgrounds. This approach was adopted with the aim of integrating the strengths and mitigating the shortcomings of the two alternative approaches. Appendix 9 contains information about the structure of each group in terms of job responsibilities, sectors (including a short profile of each participating company), nationality and gender. Section 3.7.4 describes the composition of each focus group in more detail.

### 3.7.3 Group Size

As noted in section 3.4.3, the number of participants involved in a focus group discussion will vary, with Morgan (1998) suggesting that it generally ranges from six to ten participants. Collis and Hussey (2009) advise five to ten participants. Bryman and Bell (2003) noted that the participation of at least four suitably experienced and knowledgeable people are usually required for useful insights to be generated. Blackburn and Stokes (2000) found groups of more than eight difficult to manage. In determining the number of invitees, the issue of possible “no-shows” and resultant need to over-recruit has been identified by a number of authors, notably Wilkinson (1999).

Figure 3.8 depicts how group size can influence group discussion controllability and the quality of the data generated. Based on this, Krueger (1998) suggests that in order to achieve ideal levels of data richness and group control, a focus group session should have between six and ten members (i.e. broadly in line with Morgan (1998) and Collis and Hussey (2009)). If a focus group session has more than ten members, the facilitator needs to apply alternative strategies to manage the group effectively (e.g. splitting it into smaller groups). If there are fewer than six participants, the group discussion can be poor and the resulting insights generated limited. However, if the group members are experts in the particular field, the minimum acceptable number of members is four, since each participant has a greater contribution to make in terms of knowledge and insight. This is in line with the suggestion of Bryman and Bell (2003).

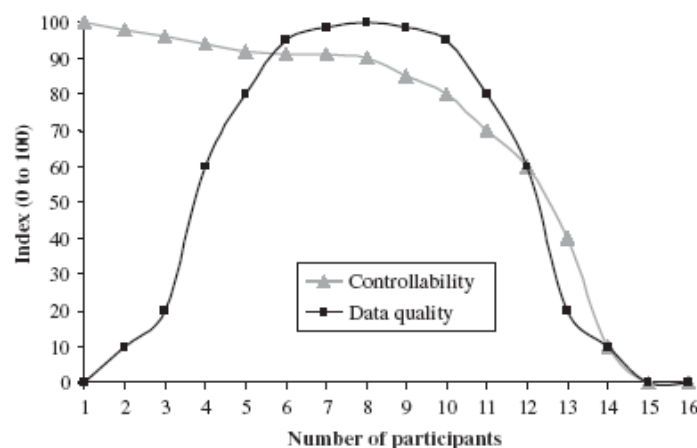


Figure 3.8: The Effect of Group Size on Quality and Controllability  
Source: Modified from Krueger (1998) and Sanchez Rodrigues et al. (2010)

In this research, the three groups comprised twelve, ten and six participants respectively (i.e. 28 individuals in total participated). This is broadly in line with the guidelines set out above but with the first group somewhat larger than that recommended by the

scholars cited. This was partly a result of over-recruiting but the author did want to solicit the views of as wide a range of people as possible. As the group dynamic is likely to vary significantly with size, selecting groups of different sizes allows different sets of group dynamics to be created. Given that the focus group method aims to explore collective (i.e. rather than individual) experience and perspectives, this in itself may be beneficial in generating new insights.

### 3.7.4 Summary of Composition and Size of Focus Groups

Appendix 9 contains information about the structure of each group in terms of job responsibilities, sectors (including a short profile of each participating company), nationality and gender.

Of the 28 individuals who participated (i.e. twelve in FG1, ten in FG2 and six in FG3), Figure 3.9 shows the breakdown of the groups in terms of broad industry sector. The “manufacturing” category includes firms involved in the food and beverage, pharmaceutical and electrical equipment sectors. In some cases, the participant’s company was involved in more than one of these broad sectors (e.g. both manufacturing and distribution). In such cases, that aspect of the business that represents the greater proportion of company turnover determined how the firm was categorized.

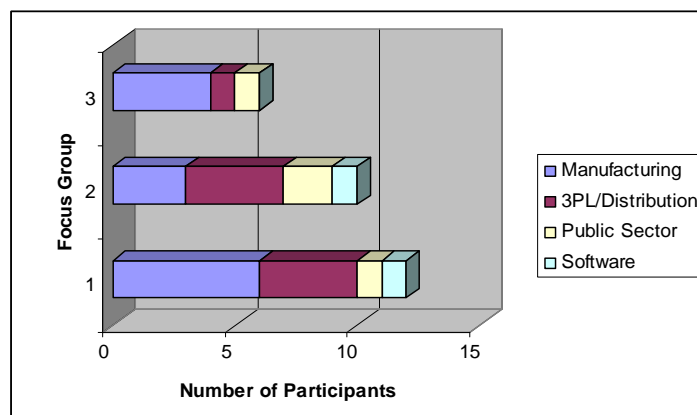


Figure 3.9: Focus Group Sectoral Breakdown

The focus group composition was also set up in such a way as to ensure that a common frame of reference existed across the three groups. For example and as illustrated in Figure 3.10: both FG1 and FG2 had a representative from MAN1 (a different person in each case); both FG1 and FG3 had a representative from MAN6 (again a different person in each case); and, FG2 and FG3 had a representative of PS1 (also a different person in each case). This ensures a degree of consistency across the groups and

facilitates comparisons across the three groups. Using a different person from the same company in different groups (i.e. as opposed to the same person participating in multiple groups) also maximises the number of views solicited.

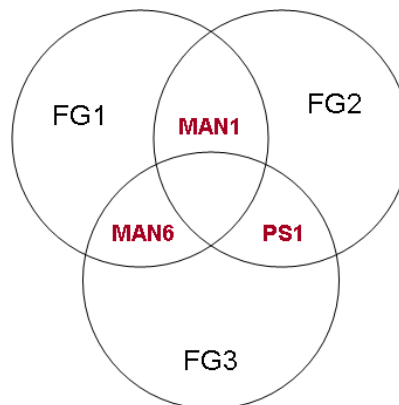


Figure 3.10: Company Overlap across Focus Groups

In terms of nationality (see Figure 3.11), the majority of the participants were Irish (18 out of 28) with all of the remainder citizens of other European Economic Area countries<sup>31</sup>. In relation to gender (see Figure 3.12) the majority were male (18 out of 28). However, it should be noted that neither nationality nor gender were used as selection factors.

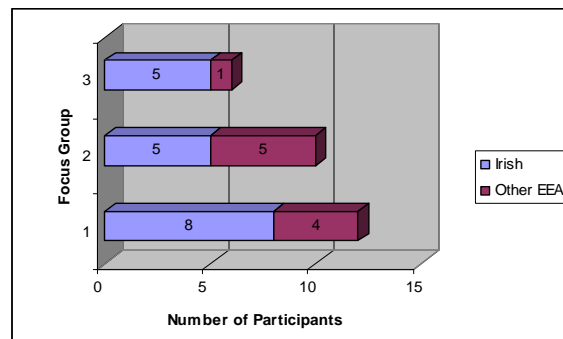


Figure 3.11: Nationality of Focus Group Participants

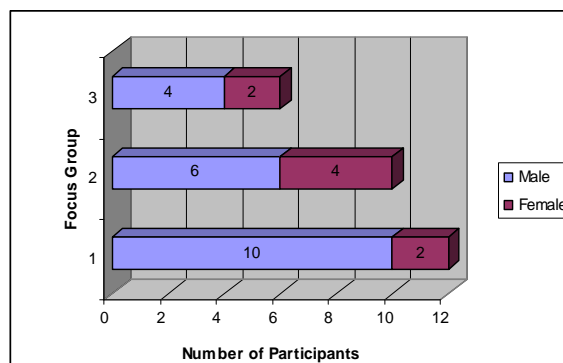


Figure 3.12: Gender of Focus Group Participants

<sup>31</sup> Germany, Poland (2), France, UK (2), Estonia, Denmark, Latvia, Iceland.

### ***3.7.5 Conducting the Focus Groups***

The following sections describe how the focus group research was conducted with specific reference to three key issues:

- balancing structured and unstructured approaches;
- venue, logistics and layout; and,
- the role of facilitation/moderation.

#### Structured vs. Unstructured

Bryman and Bell (2003, p. 374-5) suggest that the approach adopted should not be intrusive and structured with a fairly small number of very general questions guiding the session. The role of the moderator/facilitator is critical in this regard (see below). As noted earlier, the author also found the work of Sanchez Rodrigues et al. (2010) instructive with regard to managing the “controllable” factors in a focus group setting (see Figure 3.7). Again one of the key factors they identify relates to the role of the moderator/facilitator.

A number of authors (Blackhurst et al., 2005; Sanchez Rodrigues et al., 2010) suggest that asking participants to record their opinions before the discussion starts, or even in advance of the focus group sessions, helps to ensure that all participants’ opinions are aired. Sanchez Rodrigues et al. (2010) described the use of “Post-It” note exercises as a specific means of encouraging contributions from all participants.

Ultimately, the key is to ensure that a balance exists between: (i) the need to focus on the researcher’s specific questions (i.e. the need for *structure*); and, (ii) keeping the discussion open and interesting for participants so that rich insights can be generated (the need for *lack of structure*). In this way, focus group research can achieve the advantages of both extremes, whilst simultaneously mitigating the disadvantages of each. In many ways this is analogous to the concept of semi-structured (or focussed) interviews in relation to one-to-one discussions. It was this approach that the author adopted in the conduct of the focus groups.

The execution of the three focus group sessions followed a similar pattern (see Table 3.4). In each session, participants were afforded the opportunity to introduce each other. In practice some participants already knew each other – inevitable in a small country

like Ireland. As an “ice-breaker” this process was carried out in teams of two with participants introducing the person with whom they were paired based on a series of pre-defined questions (relating to name, employer, role and primary responsibilities, experiential background and academic background).

Agenda Item	Approximate Time
<b>Self-introductions</b>	15 minutes
<b>Presentation: introduction to research project</b>	15 minutes
<b>Sub-groups: “What is SCM?”</b>	30 minutes
<b>Plenary discussion</b>	60 minutes
<b>Presentation: overview of <i>Four Fundamentals</i></b>	20 minutes
<b>Discussion/critique of <i>Four Fundamentals</i></b>	40 minutes

Table 3.4: Focus Group Execution

Following these self-introductions, a short introduction to the research project was presented by the author and the purpose of the focus group component of the overall research design clearly set out. This built on the introduction provided to participants when they were first invited. Given the relatively large size of FG1 and FG2, they were divided into sub-groups. For FG1 there were four sub-groups, each with three participants; for FG2 there were three sub-groups (two groups of three and one group of four). In these cases, care was taken to ensure that each sub-group represented a range of sectors and personal backgrounds. In each case, the groups were asked to respond to the facilitator’s question “What do you understand by the phrase *supply chain management*?” In the case of FG1 and FG2, the sub-groups discussed the questions without the involvement of the facilitator for about 30 minutes. For FG3 this step was omitted and the plenary discussion took place immediately. Following the plenary discussion, the author made a short presentation of the *Four Fundamentals* construct, making reference back where possible to points raised by participants during the plenary discussion. An overview of this presentation is shown in Table 3.5 (below). As indicated in the table each component part of the presentation was a summary of the relevant sub-section from sections 2.8 to 2.11 in Chapter 2. Participants were then asked to consider and comment on the validity of the construct in general terms, as well as on



its specific applicability in their own sectors. The final part of the focus group session was a facilitated discussion on these issues.

<u><i>Fundamental One – Objectives</i></u> 2.8.1 The Role of Objectives 2.8.2 Customer Service 2.8.3 Total Supply Chain Investment and Costs 2.8.4 The Service/Cost Conundrum 2.8.5 <i>Fundamental One</i> : Summary and Some Concluding Points	<u><i>Fundamental Two – Philosophy</i></u> 2.9.1 Supply Chain Integration 2.9.2 Internal Chain Integration 2.9.3 External Chain Integration 2.9.4 Performance Measurement 2.9.5 <i>Fundamental Two</i> : Summary and Some Concluding Points
<u><i>Fundamental Three – Flow Management</i></u> 2.10.1 Supply Chain Flows 2.10.2 Managing Material Flows 2.10.3 Managing Money Flows 2.10.4 Managing Information Flows 2.10.5 <i>Fundamental Three</i> : Summary and Some Concluding Points	<u><i>Fundamental Four – Relationships</i></u> 2.11.1 Supply Chain Relationships 2.11.2 Types of Relationships 2.11.3 The Impact of Vertical Disintegration 2.11.4 Strategic Partnering 2.11.5 The People Dimension 2.11.6 <i>Fundamental Four</i> : Summary and Some Concluding Points

Table 3.5: Overview of Focus Group Presentation of the *Four Fundamentals*

#### Venue, Logistics and Layout

Collis and Hussey (2009) note the need for a “neutral” location and the creation of a relaxed atmosphere. Thus, location is one of the “controllable” factors identified by Sanchez Rodrigues et al. (2010). One simple example from their experience was that by holding sessions in various parts of the UK the traveling time of participants was minimized. For this reason, two of the author’s focus group sessions were conducted in Dublin and one in Cork. In each case, the venue was chosen with the convenience of participants in mind and a u-shaped layout was used to encourage participation and interaction.

#### Facilitation/Moderation

As noted in section 3.4.3, to maximize the benefits of using a focus group, identification of a skilled moderator (or facilitator) is of critical importance. In his widely cited paper on the use of focus groups in nursing studies, Sim (1998) highlights this issue by noting that the skills and attributes of the moderator/facilitator and his/her role in data collection exerts a powerful influence on the quality of the data collected in any focus group. This individual creates an environment in which the participants feel relaxed and encouraged to exchange views and ideas about the topic being investigated.

Bryman and Bell (2003) identify the role of the moderator or facilitator in terms of guiding each session without being too intrusive. They state that:

Clearly, the moderator has to straddle two positions: allowing the discussion to flow freely and intervening to bring out especially salient issues, particularly when group participants do not do so (p. 376).

The use of the terms “facilitator” and “moderator” signals two different but complementary aspects of the role. The former relate to the need to, for example, lead the discussion and generate new lines of discussion as appropriate. The latter relates to the need to, for example, enable all views to be aired and avoid a small number of strong personalities dominating the discussion. As Sanchez Rodrigues et al. (2010, p. 88) put it, “The nature of the facilitation is important both for *stimulating discussion* and for *ensuring that everyone participates*.” – the italicized phrases capture the dual nature of the role. Sim (1998) suggests that the facilitator has to generate interest in and discussion about a particular topic, which is close to his or her professional or academic interest, without at the same time leading the group to reinforce existing expectations or confirm a prior hypothesis. Finally, Sanchez Rodrigues et al. (2010) suggest that the role of the facilitator/moderator should be a dynamic one that evolves over a series of focus group sessions. They note that:

The most important element, however, is for the research team to reflect upon each focus group and, if necessary, adjust the facilitation approach to improve the quality of data collected (p. 88).

Finally, they identify a range of specific skills required of a facilitator/moderator based on the various roles carried out. These are summarized in Table 3.6 (below).

- |  |
|--|
| <ul style="list-style-type: none"> <li>• Expert consultant in the topic discussed, having a similar level of knowledge of the subject to that of the group as a whole</li> <li>• Challenger, questioning the opinions of participants, making the group rethink their assumptions and not allowing dominant members to divert the discussion onto less relevant topics</li> <li>• Referee, intervening when there is conflict between participants</li> <li>• Discussion leader, actively facilitating and guiding the group</li> <li>• Effective interrogator, capable of asking probing questions</li> </ul> |
|--|

Table 3.6: Skills and Roles of Focus Group Facilitator/Moderator  
Based on Sanchez Rodrigues et al. (2010); Krueger (1998); and, Morgan (1998)

A facilitator was chosen for the author’s focus groups with some care based on these issues. Though the term “facilitator” is used in this context, the role did involve both the facilitative and moderating elements alluded to in the previous paragraphs. The

individual is a skilled and experienced facilitator with a good knowledge of SCM. The latter was deemed to be important in ensuring that discussion was stimulated effectively throughout the three sessions. However, the facilitator was briefed to avoid leading groups to conclusions and to steer clear of expressing personal opinions – however strongly held – about the issues under discussion. The facilitator used a flip chart throughout the discussions to capture key points as they arose. He also furnished a report to the author on the key issues that emerged during the sessions as he perceived them. These two items (i.e. the flip charts and the facilitator's reports) were key inputs to the documenting of the three focus groups summaries (see section 5.2).

### ***3.7.6 Analysing the Focus Group Data***

The following sections describe the data analysis considerations that informed detailed focus group design with specific reference to the concept of theory saturation and the actual analytical process itself.

#### **Theory Saturation**

As noted by Bryman and Bell (2003, p. 373):

When the moderator is able to anticipate fairly accurately what the next group is going to say, then there are probably enough groups already. This notion is similar to theoretical saturation.

In other words, using multiple focus groups allows the focus group researcher to assess the extent to which saturation has been reached. Onwuegbuzie et al. (2009) distinguish between *data saturation* (i.e. when information occurs so repeatedly that the researcher can anticipate it and whereby the collection of more data appears to have no additional interpretive worth) and *theoretical saturation* (i.e. occurring when the researcher can assume that her/his emergent theory is adequately developed to fit any future data collected).

The importance of this concept is highlighted by Sanchez Rodrigues et al. (2010, p. 88) in their reflection on the role of focus group research in logistics research when they state that:

One of the main lessons from the analytical stage is the need to reflect upon any bias in the findings. Testing for theory saturation can help to detect bias and assess the thoroughness with which the subject has been discussed.

They go on to note that previous applications of the method in the field of logistics appear not have measured the degree of theory saturation, with an exception being Cullen and Webster (2007). However, their paper does not provide information on how this measurement was carried out; it merely states that “four groups were planned for this study, but theoretical saturation was reached after three, and the fourth was not required” (Cullen and Webster, 2007, p. 211).

A number of authors have suggested that three to six different focus groups are adequate to reach data saturation and/or theoretical saturation (see, for example: Onwuegbuzie and Collins, 2007; Krueger, 1998; and, Morgan, 1998). As intimated in section 3.7.2 (above), in the author’s research three focus groups were conducted as it was felt that data saturation had been reached at this point. The facilitator and the author were able to anticipate quite accurately at this point how participants were likely to respond to particular prompts. For example (and as explained in detail in section 5.4.1) many of the key discussion points that emerged during FG3 were very similar to issues that emerged during the two earlier sessions. As with Cullen and Webster (2007), four groups had been planned initially but the fourth was not deemed to be required.

#### Analytical Process

The focus group session will work best if it is tape-recorded and subsequently transcribed (Bryman and Bell, 2003, p. 371). Robson (2003) also generally recommends audio but notes too that “there are some situations where this may affect the working of the group (perhaps because of the sensitivity of the topic, or the characteristics and expectations of group members)” (p. 288). The three focus group sessions were recorded. The author’s experience suggests that any initial participant misgivings in relation to this largely disappear once the discussion is underway.

As noted by Sim (1998), focus groups aim to explore collective (i.e. rather than individual) experience and perspectives. However, Kitzinger (1994) has observed that reports of focus group research frequently do not take into account interaction within the group. This is somewhat surprising, given that it is precisely the operation of social interaction that would seem to distinguish the focus group method from a one-to-one interview. Yet, as noted by Bryman and Bell (2003, p. 378), very few accounts of focus group research “cite or draw inferences from the patterns of interaction within the group”. In other words, far more attention has been devoted to how groups are

organized and conducted than to issues of analysis. As noted in their paper on enhancing the methodological rigour of focus group research, Kidd and Parshall (2000, p. 293) state that:

Although exploitation of group dynamics is touted as a virtue of focus groups, there is very little guidance in the literature with respect to how differences between group and individual discourse impact the analysis and interpretation of focus group data.

In their article, the authors describe analytical challenges inherent in the interpretation of focus group data and suggest a number of approaches for enhancing the reliability and validity of focus group findings. For this and other reasons, Robson (2002, p. 288) suggests that “much of the literature of focus groups is methodologically naïve”. In other words, the description of much previous focus group research appears to be based on fact finding without specific reference to appropriate theoretical bases (i.e. “naïve empiricism”).

The author and the facilitator were mindful of these issues in the conduct of the focus groups. Furthermore, and in a similar manner to the analysis of the focussed interviews in Chapter 4, the focus group analytical process was guided by the key criteria for judging qualitative research recommended by Lincoln and Guba (1985). This is discussed in more detail in section 5.4.

### **3.8 Phase III: Survey Questionnaire**

#### ***3.8.1 Background***

As Oppenheim (1992, p. 7) stated:

Too often, surveys are carried out on the basis of insufficient design and planning or on the basis of no design at all. ‘Fact gathering’ can be an exciting and tempting activity to which a questionnaire opens a quick and seemingly easy avenue; the weaknesses in the design are frequently not recognised until the results have to be interpreted – if then!

This highlights the need for robust approaches to the design of questionnaires. Several authors have proposed models that indicate the main stages in the process. For example, Robson (2002) suggests that there are five main stages in this process: initial planning and design; questionnaire design; questionnaire pre-testing; final design and planning; and, data collection, presentation and analysis. Collis and Hussey (2009) propose an

alternative process comprising seven stages; their approach focuses more on the design and testing of the actual questionnaire. The stages are: develop and justify the questions; determine the order of presentation; write the accompanying letter; test questionnaire with a small sample; choose distribution method; plan strategy for dealing with non-responses; and, conduct tests for validity and reliability. The approach adopted by the author and the structure of this section are based on the proposed processes of Robson (2002) and Collis and Hussey (2009) and is shown in Figure 3.13 (below).

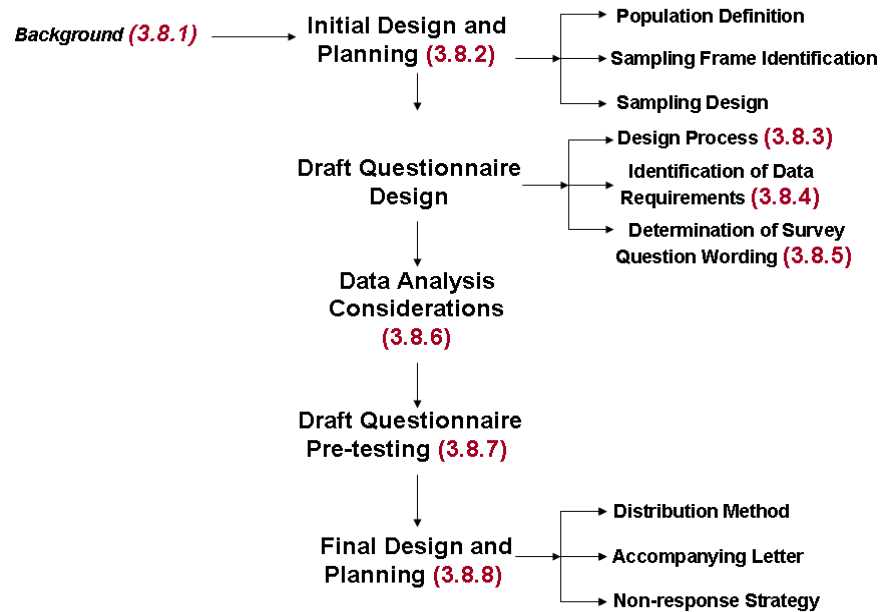


Figure 3.13: Main Stages in Carrying Out a Questionnaire Survey and Structure of Section 3.8  
Based on Robson (2002) and Collis and Hussey (2009)

Section 3.8.2 deals with initial design and planning, with a specific focus on population definition, sampling frame identification and sampling design. The following sections explain the main elements of the draft questionnaire design process: an overview of the design process (3.8.3); identification of data requirements (3.8.4); and, determination of survey question wording (3.8.5). Some data analysis considerations are then set out in section 3.8.6 before the process of draft questionnaire pre-testing is explained (section 3.8.7). The final design and planning is described in section 3.8.8, with specific reference to distribution method, the structure of the accompanying letter and the author's non-response strategy.

### 3.8.2 Initial Design and Planning

Much of survey design and initial planning is typically dealt with during the overall research design for a project. For example, the role that the survey plays in the context of the wider research methodology is clearly set out at this stage (see section 3.5). Part of this involves ensuring that survey execution is clearly linked to the research questions, and thus back to the literature review. The importance of this is set out succinctly by Robson (2002):

The importance of a theoretical framework for surveys seeking to move beyond description to explanation can not be over-estimated. Whether expressed in terms of a set of possible mechanisms and the contexts in which they operate, or in other terms, they prevent the survey questionnaire degenerating into a fishing trip where questions are added simply because ‘it seemed a good idea at the time’ (p. 240).

This point is particularly important in SCM research generally, and in the current research specifically, given the claim of Storey et al. (2006) that the “precepts of SCM as portrayed in the literature are a mix of description, prescription and the identification of trends” and that the literature “tends to move rather imperceptibly” (p. 757) between these elements.

Other key issues involved in the planning stage include defining the total *population* to be studied, identifying an appropriate *sampling frame* and determining the *sampling design* to be adopted. The following sections explain the approach adopted by the author in relation to these issues.

#### Population Definition

One possible approach to this is to define the population as all firms in Ireland. The justification for this could be that all firms – irrespective of sector or size – are part of a wider supply chain. A broad definition of SCM – such as the *Four Fundamentals* construct – is in line with this approach. Table 3.7 (below) shows the Companies Registrations Office (CRO) breakdown of companies in Ireland at the end of 2009 and indicates that there are just over 180,000 registered companies. Business demographic data from the Irish Central Statistical Office (CSO) estimates the total number of firms at over 203,083 (CSO, 2011). The higher number reflects the fact that the CSO data includes sole traders, partnerships and other legal forms that are not required to register

with the CRO. In any case, adopting this approach involves defining the population as being somewhere between 180,000 and just over 203,000 firms.

	2008	%	2009	%
Private Limited	159,896	86.74	160,226	86.58
Public Limited	1,728	0.94	1,708	0.92
Unlimited	3,638	1.97	3,737	2.02
Guarantee	15,285	8.29	15,562	8.41
External	3,766	2.04	3,791	2.05
EEIG	20	-	20	-
Total	184,306		185,044	

*Note : this table excludes companies in the course of liquidation*

Table 3.7: Register of Companies at the End of 2009  
Source: CRO (2010)

However, there may be some justification for confining the survey to particular sectors or for excluding certain sectors on the basis of their limited exposure to SCM thinking and/or its limited relevance in these sectors. The former approach has been widely adopted in previous empirical studies, while the latter involves justifying the exclusion of firms in specific sectoral categories using well established industry classifications (e.g. NACE).

Part of the author's literature review as presented in Chapter 2 involved an analysis of earlier empirical studies directly relevant to the current research. In total 90 previous empirical SCM/logistics studies were reviewed in some detail (see Appendix 7). The data in Figure 3.14 (below) show the sectoral foci of these studies. Many papers (listed under "various") incorporated a wide range of sectors. A further group of papers have a focus on manufacturing organisations in general ("various manufacturing") which is perhaps not surprising given that much SCM theory and practice has its origins in manufacturing. A number of studies illustrate this breadth (for example: Ketikidis et al. (2008) focused on "manufacturing and trading"; Toyli et al. (2008) on "manufacturing, wholesale and retail"; Heide et al. (2008) on "trade and manufacturing"). However, most papers neither fully explain what precisely is encompassed by these broad sectoral classifications nor do they provide any meaningful justification for their selection. For example, the specific focus of Ketikidis et al. (2008) is the use of information systems in the supply chain and their research involved emailing a questionnaire to 300 firms in



various South East European countries. The only justification provided for their population identification is that:

Manufacturing and trading enterprises were the target groups because they tend to adopt such information systems and it was envisaged that interesting results could be obtained (p. 595).

For the current research, a more meaningful justification is desirable if the population to be studied is to be narrowed by focussing on particular sectors.

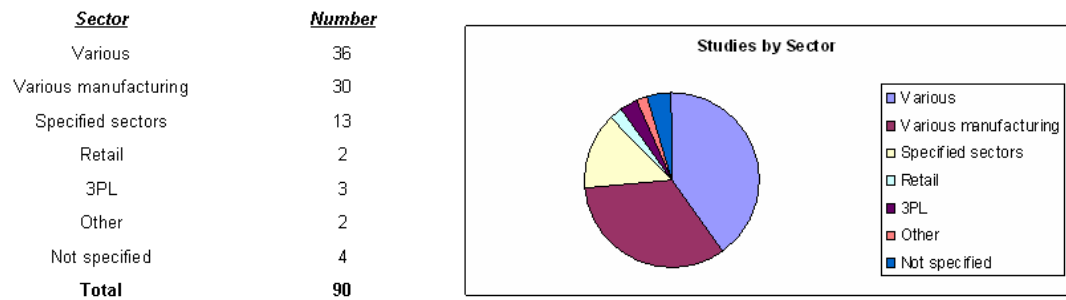


Figure 3.14: Empirical Studies by Sector

Some of these earlier papers had quite a narrow focus (“specified sectors”) exploring particular industry sectors in some detail (for example: Brun et al. (2008) examined the luxury fashion industry; Davila and Wouters (2007) studied disk drive manufacturing; Korneliussen and Gronhaug (2003) focussed on the salmon farming industry). A small number of studies were specifically concerned with the retail and 3PL links in the supply chain. Identification of an appropriate sampling frame is – by definition – easier when specific sectors are the focus of research. However, the author’s research questions are broad in scope and do not lend themselves to a relatively narrow focus on specific sectors. As noted earlier, a possible alternative approach involves excluding certain sectors on the basis of their limited exposure to SCM thinking and/or its limited relevance in such sectors.

NACE (Nomenclature générale des Activités économiques dans les Communautés Européennes) is the EU statistical classification of economic activities. The current version (NACE Rev. 2) was adopted by the Irish Central Statistics Office (CSO) as its standard in 2008. Each top-level category (21 in total, labeled “A” to “U”) is disaggregated into further detail as shown in Table 3.8.

<p>Level 2: 88 divisions identified by two-digit numerical codes (01 to 99);</p> <p>Level 3: 272 groups identified by three-digit numerical codes (01.1 to 99.0);</p> <p>Level 4: 615 classes identified by four-digit numerical codes (01.11 to 99.00).</p>
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Table 3.8: NACE Rev. 2 Industry Category Disaggregation

Each category was considered for possible inclusion in the population to be studied on a case by case basis. The first two categories provide an illustration of how this was approached. NACE A (agriculture, forestry and fishing) is defined as “the exploitation of vegetal and animal natural resources” and continues to be an important sector in the Irish economy. It largely comprises farms of which there were almost 130,000 units greater than one hectare in size according to the 2007 CSO *Farm Structure Survey*. Such units are of limited interest in the current research and this category has, therefore, been excluded from the study. It is important to emphasise that NACE category A does not include processing, manufacturing and distribution activities related to the food sector, all of which are classified under other appropriate NACE codes (e.g. NACE code 1011 in category C (“Manufacturing”) refers specifically to “processing and preserving of meat”). Such activities will be included in the survey. Furthermore, exclusion of NACE category A from surveys of this kind is in line with the EU/OECD business demography approach which suggests that such firms are excluded “mainly due to the current coverage of statistical business registers in most OECD and EU countries”. Thus, even if this category were included identifying an appropriate sampling frame would be problematic. However, it is recommended that a study of the adoption of SCM practices in this sector be undertaken as a separate exercise. On the other hand, there does not appear to be any valid reason for exclusion of NACE B (mining and quarrying) and it is, therefore, included in the survey. CSO data indicate that there are 385 firms in this category. A similar process was adopted in relation to all NACE categories. Table 3.9 below shows the 21 NACE top-level categories and indicates those that have been included and excluded from the survey.

<b>Code</b>	<b>Category</b>	<b>Included, partially included, excluded</b>
A	AGRICULTURE, FORESTRY AND FISHING	Excluded
B	MINING AND QUARRYING	Included
C	MANUFACTURING	Included
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	Included
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	Included
F	CONSTRUCTION	Excluded
G	WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES	Included
H	TRANSPORTATION AND STORAGE	Included
I	ACCOMMODATION AND FOOD SERVICE ACTIVITIES	Excluded
J	INFORMATION AND COMMUNICATION	Included
K	FINANCIAL AND INSURANCE ACTIVITIES	Excluded
L	REAL ESTATE ACTIVITIES	Excluded
M	PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES	Excluded
N	ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	Excluded
O	PUBLIC ADMINISTRATION AND DEFENCE; COMPULSORY SOCIAL SECURITY	Excluded
P	EDUCATION	Excluded
Q	HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	Partially included
R	ARTS, ENTERTAINMENT AND RECREATION	Excluded
S	OTHER SERVICE ACTIVITIES	Included
T	ACTIVITIES OF HOUSEHOLDS AS EMPLOYERS; UNDIFFERENTIATED GOODS- AND SERVICES-PRODUCING ACTIVITIES OF HOUSEHOLDS FOR OWN USE	Excluded
U	ACTIVITIES OF EXTRATERRITORIAL ORGANISATIONS AND BODIES	Excluded

Table 3.9: NACE Top-Level Categories Included in and Excluded from the Survey

Analysis of Table 3.9 indicates that eight NACE level one categories have been proposed for inclusion, 12 for exclusion and one (“human health and social work activities”) for partial inclusion. The great majority of entities in this category are not of interest, particularly those related to specialised social work activities, and were excluded. However, many health care activities are of strong interest. For example, the Health Services Executive (HSE) in Ireland is a major buyer of a wide range of medical and non-medical products and services and employs a large number of purchasing and

materials management professionals. More specifically, there are a small number of organisations under one specific NACE level 4 class – i.e. 8610 (“hospital activities”) – part of which is of interest. Care was taken, therefore, not to exclude HSE and private sector purchasing and materials management activities. The tiny number of organisations of interest in this area (negligible in the context of the approximately 200,000 firms that exist in Ireland) does not materially impact on sampling considerations.

Table 3.10 shows the included categories and the number of firms in each based on CSO business demographic data. The approach adopted in terms of inclusion and exclusion of NACE categories is in line with that of the EU and the OECD as set out in the *Eurostat - OECD Manual on Business Demography Statistics*. The economic activities for which business demography indicators are produced are NACE Rev 2 categories B to N (i.e. excluding categories A and P to S). The author has retained category S as it provides a potentially useful residual category for service firms whose primary activities do not readily lend themselves to classification using one of the other labels. However, it is very small and represents just 0.6% of the total number of targeted firms. The *Eurostat - OECD Manual on Business Demography Statistics* notes that the inclusion of categories B to N and the exclusion of categories A and P to S results in:

activities relating to production, construction, distributive trades and services are covered, but agriculture, public administration, non-market activities of households, and extra-territorial agencies are not. This is mainly due to the current coverage of statistical business registers in most OECD and EU countries.

As noted previously in the specific context of exclusion of the “agriculture, forestry and fishing” category from the current study, the current limited coverage of these categories would make the identification of an appropriate sampling frame problematic.

<b>Sector (NACE level 1 category code)</b>	<b>No. of firms</b>	<b>% of total</b>
Mining and quarrying (B)	385	0.5%
Manufacturing (C)	12886	16.4%
Electricity, gas, steam and air conditioning supply (D)	209	0.3%
Water supply; sewerage, waste management and remediation activities (E)	785	1.0%
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	43205	54.9%
Transportation and storage (H)	11069	14.1%
Information and communication (J)	9682	12.3%
Other service activities (S)	450	0.6%
Human health and social work activities (Q)	n/a	
<b>Total</b>	<b>78671</b>	<b>100.0%</b>

Table 3.10: Number of Firms in the Targeted NACE Top-Level Categories  
Source: CSO (2011)

As per the data in Table 3.10, the total number of firms in the targeted categories is 76,781 firms. This represents 38.7% of the total number of firms in Ireland (203,083) as per CSO business demographic data. However, the great majority of these firms are micro-enterprises. In terms of number of employees, micro-enterprises are defined by the EU as having fewer than 10 personnel<sup>32</sup>. The CSO business demography data indicates that the number of firms with 10 employees or more is as shown in Table 3.11 below. Exclusion of micro-enterprises enterprises is justified on the basis that the great majority of such firms are unlikely to have had exposure to SCM thinking. However, small and medium-sized enterprises (SMEs), as well as large firms, are included in the survey thus allowing comparisons to be made between the SCM approaches adopted by firms of different sizes.

<b>Sector (NACE level 1 category code)</b>	<b>No. of firms</b>	<b>% of total</b>
Mining and quarrying (B)	0	0.0%
Manufacturing (C)	2775	24.2%
Electricity, gas, steam and air conditioning supply (D)	0	0.0%
Water supply; sewerage, waste management and remediation activities (E)	150	1.3%
Wholesale and retail trade; repair of motor vehicles and motorcycles (G)	6610	57.8%
Transportation and storage (H)	1029	9.0%
Information and communication (J)	831	7.3%
Other service activities (S)	50	0.4%
Human health and social work activities (Q)	n/a	
<b>Total</b>	<b>11445</b>	<b>100.0%</b>

Table 3.11: Number of Firms in the Population by NACE Category  
Source: CSO (2011)

<sup>32</sup> In addition to the staff headcount ceilings, the size an enterprise is based on either the turnover ceiling or the balance sheet ceiling, but not necessarily both.

Thus, the total number of firms in the population is 11,445. This represents 14.5% of the total number of firms in the targeted NACE categories (i.e. the great majority of firms in these categories – 85.5% - are micro-enterprises) and 5.6% of the total number of firms in Ireland. The data in Table 3.11 and Figure 3.15 (below) indicate that NACE category G (“wholesale and retail trade”) has easily the largest number of firms and represents over half of the population. Categories C (“manufacturing”), H (“transportation and storage”) and J (“information and communications”) represent the bulk of the rest of the population (40.5% collectively). The remaining categories represent less than 2% of the population. It is interesting to note that the three categories with the largest number of firms in the population (i.e. “wholesale and retail trade”, “manufacturing” and “transport and storage”) relate directly to the supply chain links of “sell”, “make” and “move & store” respectively.

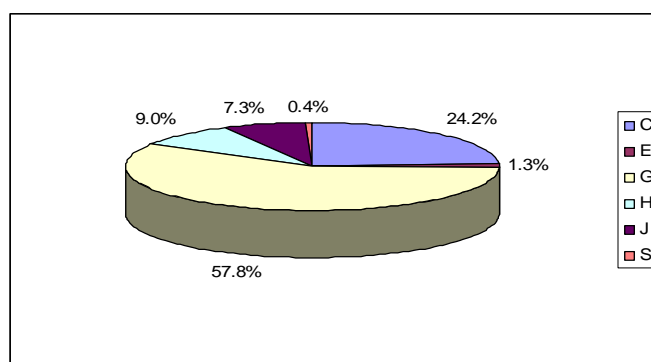


Figure 3.15: Number of Firms in the Population by NACE Category  
Source: CSO (2011)

It is also useful to further break the population down into level 2 of the NACE categories, at least for the two sectors (i.e. G and C) that represent the great majority of the firms to be studied.

NACE category G (“wholesale and retail trade”) is broken down into three level 2 divisions (“motor trade”, “wholesale trade” and “retail trade”). The breakdown of NACE category G firms in the population is shown in Table 3.12 and in Figure 3.16.

Sector (NACE level 2 division code)	No. of firms	% of total
Motor trades (45)	804	12.2%
Wholesale trade (46)	2123	32.1%
Retail trade (47)	3683	55.7%
<b>Total</b>	<b>6610</b>	<b>100.0%</b>

Table 3.12: NACE Category G - Breakdown of Population by Level 2 NACE Divisions  
Source: CSO (2011)

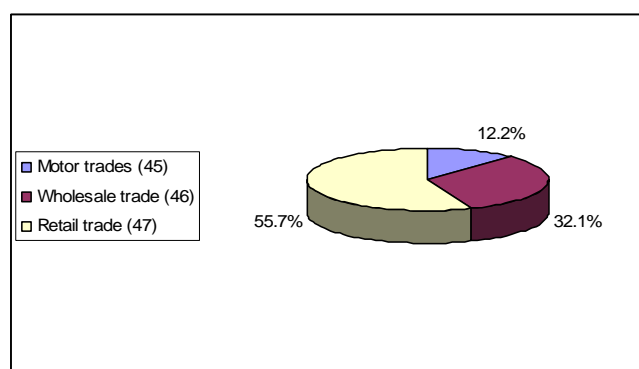


Figure 3.16: NACE Category G - Breakdown of Population by Level 2 NACE Divisions  
Source: CSO (2011)

As indicated earlier, “manufacturing” is the category that is most highly disaggregated in NACE. It is decomposed into 24 level 2 divisions each of which represents a specific manufacturing sector (e.g. “manufacture of leather and related products”). The breakdown of NACE category C firms in the population is shown in Table 3.13 and in Figure 3.17.

Sector (NACE level 2 division code)	No. of firms	% of total
Food products, beverages and tobacco (10 to 12)	456	16.4%
Textiles and wearing apparel (13,14)	109	3.9%
Leather and related products (15)	0	0.0%
Wood and wood products, except furniture (16)	158	5.7%
Paper and paper products; printing and reproduction of recorded media (17,18)	246	8.9%
Chemicals and pharmaceuticals (20,21)	149	5.4%
Rubber and plastic products (22)	183	6.6%
Other non-metallic mineral products (23)	221	8.0%
Basic metals and fabricated metal products (24,25)	453	16.3%
Computer, electronic, optical and electrical equipment (26,27)	169	6.1%
Machinery and equipment n.e.c. (28)	207	7.4%
Transport equipment (29,30)	58	2.1%
Furniture and other manufacturing (31,32)	315	11.3%
Repair and installation of machinery and equipment (33)	51	1.8%
Coke and refined petroleum products (19)	0	0.0%
<b>Total</b>	<b>2775</b>	<b>100.0%</b>

Table 3.13: NACE Category C - Breakdown of Population by Level 2 NACE Divisions  
Source: CSO (2011)

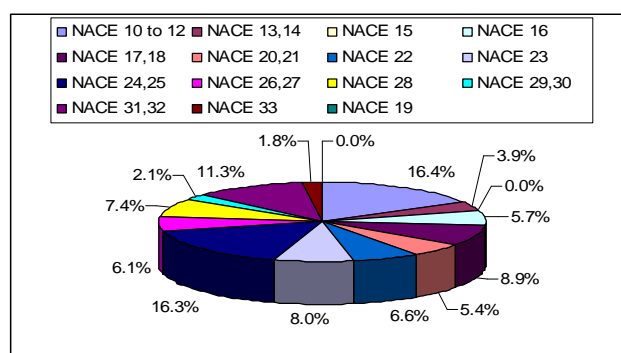


Figure 3.17: NACE Category C - Breakdown of Population by Level 2 NACE Divisions  
Source: CSO (2011)

### Sampling frame identification

A sampling frame is “a list of all of those eligible to be included in the sample” (Easterby-Smith et al., 2008, p. 332). In many cases, it may not be possible to generate a complete and accurate database of the total population. The extent to which the sampling frame is representative of the total population is, therefore, of great importance. As stated by Robson (2002):

If a reasonably adequate sampling frame can be obtained, this puts you in the position of being able to draw a (reasonably) adequate random sample, i.e. a sample where all members of the population of interest have an equal chance of being selected for the sample (p. 241).



In the context of the author's research, there is no single reliable database that provides contact details of all firms in the population. Some researchers have used commercial databases such as KOMPASS and AMADEUS. Kinsella (2009) adopted this approach for his study of the age distribution of firms registered in Ireland across all NACE categories. This approach is satisfactory where the research involves analysis of high level data based on secondary sources. However, it does not provide the contact information required for an appropriate sample to be readily identified for a questionnaire survey.

One possible way of addressing this challenge is to use the database of the National Institute for Transport and Logistics (NITL). This database has several thousand email contacts and has been used previously for empirical surveys of various kinds. It started life as a commercial database (KOMPASS) with new contacts having been added over a ten year period. It is also regularly refined to ensure that contact details are kept as up to date as possible. However, for this database to be usable for the current research a sample needs to be identified that is genuinely representative of the total population under consideration. To this end, the author has coded all entries in the database in line with the NACE codes. In this way, a stratified sample can be drawn from the wider database that reflects the breakdown of the population.

### Sampling design

Once the sampling frame has been identified, the sampling technique to be adopted then needs to be chosen. Saunders et al. (2009) provide a useful overview of possible sampling techniques, based on both probability and non-probability sampling (p. 213). The former (i.e. probability or representative sampling) involves selecting a sample where the probability of each case selected from the total population is known and is usually equal; the latter (i.e. non-probability or judgemental sampling) does not and therefore makes it difficult to make statistical inferences about the characteristics of the population as a whole. These are key issues in the process of *sampling design*.

As pointed out by Easterby-Smith et al. (2008), the essence of sampling design is about "combining precision and representativeness to achieve a credible sample" (p. 214-5). The former depends on the size of the sample with small samples always being less

precise than larger ones; the latter is about ensuring that the sample is genuinely representative of the total population.

As noted earlier, the chosen sampling technique is stratified random sampling. This is defined by Saunders et al. (2009) as a:

Probability sampling procedure in which the population is divided into two or more relevant strata and a random sample is drawn from each strata (p. 601).

They suggest that the procedure involves a number of stages.

Firstly, the stratification variable needs to be chosen. This is based on the NACE codes as discussed previously. The strata used were the NACE level 1 categories C, E, G, H, J and S (see Figure 6.3 above). The categories with the largest number of firms – G and C – were further decomposed into their level 2 NACE divisions (as shown in Figures 3.16 and 3.17 respectively) thus providing a rational basis for further stratifying the sampling frame. The total number of strata is 21<sup>33</sup> and the proportion of the total population in each stratum is as shown in Table 3.14 below.

Secondly, the sampling frame (i.e. the NITL database) is divided into these discrete strata. A random sample is then selected ensuring that each of the strata is represented proportionally. Given that the response rates in the majority of the previous empirical studies reviewed by the author (see Appendix 7) were less than 20%, and that rates between 10 and 20% were most common, the sample size was set at 1,000 in an effort to ensure that a sufficient number of usable responses was received for analysis purposes. In conjunction with the author's stratification process, this was designed to achieve the "credible sample" to which Easterby-Smith et al. (2008) referred.

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<sup>33</sup> 20 are included in Table 3.14; "Healthcare" – part of NACE category Q – is the 21<sup>st</sup>.

Level One Category	Level Two Division	No. of Firms	% of Total
NACE C	NACE 10 to 12	455	4.0%
	NACE 13,14	109	1.0%
	NACE 16	158	1.4%
	NACE 17,18	245	2.1%
	NACE 20,21	149	1.3%
	NACE 22	182	1.6%
	NACE 23	220	1.9%
	NACE 24,25	452	4.0%
	NACE 26,27	168	1.5%
	NACE 28	206	1.8%
	NACE 29,30	58	0.5%
	NACE 31,32	314	2.7%
	NACE 33	51	0.4%
NACE E	n/a	150	1.3%
NACE G	NACE 45	804	7.0%
	NACE 46	2123	18.6%
	NACE 47	3683	32.2%
NACE H	n/a	1029	9.0%
NACE J	n/a	831	7.3%
NACE S	n/a	50	0.4%

Table 3.14: Sampling Strata Based on NACE Categories and Divisions

### 3.8.3 Questionnaire Design Process

This section sets out the process used in identifying survey data requirements and in developing the actual questions to be posed in the survey instrument.

Data requirements and questions are informed by the literature review and overall project research questions (RQs) set out in Chapter 2. As noted by Robson (2002):

It is worth stressing that the questions for the questionnaire are not produced by you sitting down and trying to think of some interesting things to ask; or even by getting a group together to do this. The survey questions should be designed to help achieve the goals of the research and, in particular, to answer the research questions (p. 241).

In line with this advice, the process of designing the questions for the questionnaire was carried out in a logical and systematic manner. Specifically, the three-stage process shown in Figure 3.18 was adopted.

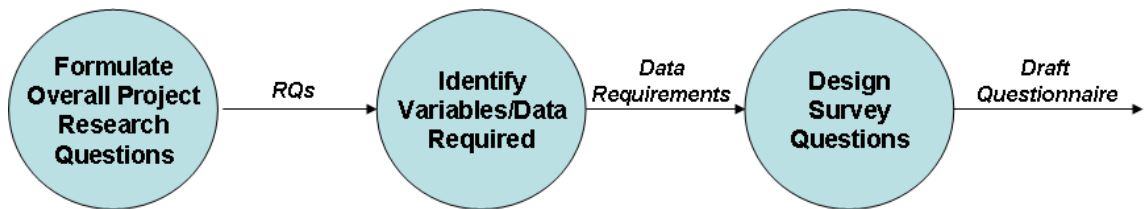


Figure 3.18: Design Process for Survey Questions

The first part of the process (“Formulate Overall Project RQs”) is part of the “Initial Planning and Design” stage of the overall approach. As noted previously, much of this stage is typically dealt with during the overall research design for a project. The key issue from the perspective of questionnaire design involves ensuring that the questions asked are clearly linked back to the overall project research questions (RQs), and thus back to the literature review. In other words, and as shown in Figure 3.18, the RQs are a key output of this stage of the process and a key input into the next stage (i.e. “Identify Variables/Data Required”).

This second stage essentially involved decomposing the four overall RQs into more detail in a logical and systematic manner – a process of *stepwise decomposition*. This process is widely used in many disciplines, perhaps most notably in software engineering (see, for example, Sajeev and Inchaiwong, 2002). It involves breaking down (i.e. *decomposing*) a process (or an objective or a question) into its constituent elements in a step-by-step (i.e. *stepwise*) manner until the detail of the process (or objective or question) is understood with sufficient clarity. It is analogous to the systematic approach proposed by Saunders et al. (2009) to ensuring that all essential data are collected. Their approach involves identifying the variables about which data needs to be collected to answer all investigative questions. In this case, stepwise decomposition of the overall RQs – in particular of RQ2 given that this question is the specific focus of the questionnaire – was carried out using the *Four Fundamentals* construct. This stage resulted in 43 detailed questions being formulated (labelled Q1A to Q14C). These questions identify the variables that the questionnaire survey is seeking to collect data in relation to. In essence, they provide the author with a list of survey data requirements.

The next step involves translating these data requirements into an actual questionnaire (i.e. “Design Survey Questions”). In relation to designing questions for surveys, Easterby-Smith et al. (2008) identify five useful principles:

1. Each question should express only one idea;
2. Avoid jargon and colloquialisms;
3. Use simple expressions;
4. Avoid the use of negatives; and,
5. Avoid leading questions.

Other scholars provide similar checklists in relation to the avoidance of problems in wording questions (see, for example: Robson (2002), p. 245-6; Saunders et al. (2009), p. 384). This stage of the process needs to be cognisant of issues such as these. This process is described in the following sections. Its systematic nature helps to ensure that: (i) RQ2 is answered as comprehensively as possible; (ii) data is collected that will contribute to the answering of the other RQs; and, (iii) the necessary data is collected to deductively test the refined *Four Fundamentals* construct.

#### **3.8.4 Identification of Data Requirements**

In line with the process set out in Figure 3.18 and described in section 3.8.3, it is necessary to identify project and questionnaire data requirements through a process of stepwise decomposition based on the *Four Fundamentals* construct. Throughout the process, data requirements were identified by developing a set of detailed questions.

The majority of these questions relate directly to RQ2 (i.e. “What is the level of adoption of SCM in practice?”) and to the deductive testing of the *Four Fundamentals* as a definitional construct. However, some of the early questions relate to RQ1 (i.e. “What is the level of understanding of SCM in practice?”), thus building on the focussed interview analysis in relation to practitioner perspectives on logistics and SCM (see Chapter 4) and the focus group work aimed at refining the *Four Fundamentals* construct (see Chapter 5). Similarly, some of the later questions relate to RQ3 (“What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?”) and, more especially, to RQ4 (“What practical measures could be put into place at policy/supply chain/firm level to improve the level of effective SCM adoption?”). It is important to note that these questions are included to ensure that the opinions of respondents are solicited about the issues in question, thus complementing the data collected using more qualitative approaches (as set out elsewhere in this thesis).

The development of one specific (and randomly chosen) question (Q7A – see Table 3.15 below) serves to illustrate the logic adopted in this process. As noted in Chapter 2,

the concept of integration has long been regarded as the central tenet of SCM and thus provides the basis of that component of the author's definitional construct (*Fundamental Two*) that attempts to capture the essence of SCM philosophy. As also noted in Chapter 2, this concept can be considered at many levels and, in particular, in terms of how it relates to both the internal and external supply chain. In the context of the former and with reference to marketing/logistics interfaces specifically, the work of Ellinger (2000) – as cited in section 2.9.2 – recognises that despite its well documented advantages the extent of internal integration in practice is limited. The work of Sweeney et al. (2007) also suggests that the perceived level of integration of internal SCM activities is relatively low. These and other arguments posited by the author in the literature review described in Chapter 2 lead directly to the question:

Q7A: To what extent are internal supply chain activities integrated?

A similar process of stepwise decomposition was carried out by the author and this is described in detail in Appendix 10. Table 3.15 shows the 43 detailed questions that were developed through this process as they relate to: (i) background and context; (ii) each of the components of the *Four Fundamentals* construct; and, (iii) implications (at firm, supply chain and policy levels).

### ***3.8.5 Determination of Survey Question Wording***

At this stage of the process the precise wording of the actual questions to be asked of respondents was determined, along with the order of presentation. As with section 3.8.4, one specific (and randomly chosen) example serves to illustrate the process adopted by the author.

<p style="text-align: center;"><b>Background and Rationale</b></p> <p>Q1A: What is meant by a supply chain and by supply chain management?  Q1B: What is meant by logistics?  Q1C: What is the relationship between SCM and logistics?  Q1D: Does the language and terminology used to define SCM contribute to confusion in understanding?  Q1E: Are single-sentence definitions of SCM of limited value?  Q1F: Are there differences of emphasis based (i) functional/professional background, (ii) business sector, and (iii) geographical base?</p>	
<p style="text-align: center;"><b>Fundamental One</b></p> <p><u>Background and Rationale</u>  Q2A: To what extent are specific SCM objectives formulated?  Q2B: Do the three key SCM objectives relate to the market (i.e. customer service), the financial (i.e. total supply chain cost and investment), and the environmental (i.e. sustainability) dimensions of the supply chain?  <u>Customer Service</u>  Q3A: Is customer service increasing in importance relative to price and quality?  Q3B: To what extent are customer service audits (internal and external) used?  Q3C: Is customer service interpreted narrowly?  Q3D: What are the elements of customer service?  Q3E: What is the relative importance of these elements?  Q3F: Is there a difference between "improving customer service" and "meeting and/or exceeding the level of customer service required"?  Q3G: Does understanding the level of service required set the specification for SCM/supply chain design?  <u>Cost and Investment</u>  Q4A: Is the concept of total supply chain cost well understood?  Q4B: To what extent is supply chain cost trade-off analysis used?  Q4C: To what extent are supply chain costing methodologies used?  Q4D: How are supply chain investment opportunities are appraised?  Q4E: Is there a difference between "reducing costs" and "optimising total supply chain cost and investment"?  <u>Service/Cost Conundrum</u>  Q5A: Are cost/investment and service optimisation perceived to be mutually exclusive?  Q5B: Is the concept of <i>value</i> understood?  Q5C: To what extent are <i>value-based approaches</i> used to support the simultaneous achievement of cost/investment and customer service objectives?  Q5D: To what extent are <i>time-based approaches</i> used to support the simultaneous achievement of cost/investment and customer service objectives?</p>	<p style="text-align: center;"><b>Fundamental Two</b></p> <p><u>Background and Rationale</u>  Q6A: Does integration plays a central role in SCM?  Q6B: What is the meaning of "integration" in an SCM context?  <u>Internal Integration</u>  Q7A: To what extent are internal supply chain activities integrated?  Q7B: Who has overall responsibility for internal SCM/SCI?  <u>External Integration</u>  Q8A: What is the level of integration with customers?  Q8B: What is the level of integration with suppliers?  <u>Performance Measurement</u>  Q9A: What supply chain KPIs are used?  Q9B: How are these KPIs used?</p>
<p style="text-align: center;"><b>Fundamental Three</b></p> <p><u>Background and Rationale</u>  Q10A: What are the key supply chain flows?  <u>Material/Money Flows</u>  Q11A: Are supply chain material flows efficiently and effectively managed?  Q11B: Are supply chain money flows efficiently and effectively managed?  <u>Information Flows</u>  Q12A: Are supply chain information flows efficiently and effectively managed?  Q12B: What ICT tools are used to support the management of supply chain information flows?</p>	<p style="text-align: center;"><b>Fundamental Four</b></p> <p>Q13A: What is the level and nature of internal supply chain collaboration?  Q13B: What is the level and nature of external upstream (i.e. customer-side) collaboration?  Q13C: What is the level and nature of external downstream (i.e. supplier-side) collaboration?  Q13D: What is the role of people/learning in the context of supply chain relationships?</p>
<p style="text-align: center;"><b>Implications</b></p> <p>Q14A: What practical measures could be implemented at policy level to improve the level of effective SCM adoption?  Q14B: What practical measures could be implemented at supply chain level to improve the level of effective SCM adoption?  Q14C: What practical measures could be implemented at firm level to improve the level of effective SCM adoption?</p>	

Table 3.15: Survey Data Requirements in the Form of Detailed Questions

The only question in the draft questionnaire that related specifically to internal integration is based on Q7A in Table 3.15 (i.e. "To what extent are internal supply chain

activities integrated?”). This question is operationalised using a five-point Likert scale as follows:

How would you describe the extent to which your company’s internal supply chain activities are integrated?

- ☐ Fully integrated
- ☐ Highly integrated
- ☐ Somewhat integrated
- ☐ Poorly integrated
- ☐ Not at all integrated

Notwithstanding the inevitable element of subjectivity involved in answering a question of this nature, the Likert scale adopted uses the same approach as an earlier empirical study of SCM practice carried out in Ireland (NITL, 2005). Thus, as well as providing a range of options to respondents, this enables some comparisons to be made in relation to how practice in this area may have changed in recent years.

Determination of the structure and wording of all questions followed a similar process. The complete draft questionnaire, therefore, largely followed the logical flow set out in Table 3.15 (above) and used a mix of open and closed questions. In total, it comprised 31 questions divided into six sections, as well as a section on respondent demographic and control information.

The final section of the questionnaire asks for demographic and control information about respondents and their companies. These questions enable the author to determine whether respondent and/or company characteristics affect respondents’ attitudes to the variables under consideration. Particular care was taken to ensure that data was captured so that Q1F in Table 3.15 – “Are there differences of emphasis based on (i) functional/professional background, (ii) business sector, and (iii) geographical base?” – could be answered.

Following an optional question that asks for company name, respondents are then asked for information about which sector their companies operate in. This is a closed question and adopts the NACE classification system. The use of this system facilitates comparisons between the author’s research and that of other EU researchers. The NACE level 1 categories of all sectors in the population are options, with level 2 divisions provided for respondents in categories C and G in line with the 21 strata used in the sampling design.



The next three questions ask for information about company size. Based on the EU definitions, enterprises qualify as micro, small and medium-sized enterprises (SMEs) if they fulfil the criteria which are summarized in Table 3.16 below. In addition to the staff headcount ceilings, the size of an enterprise is based on either the turnover ceiling or the balance sheet ceiling, but not necessarily both.

Enterprise category	Headcount	Turnover	or	Balance sheet total
medium-sized	< 250	$\leq \text{€ } 50 \text{ million}$		$\leq \text{€ } 43 \text{ million}$
small	< 50	$\leq \text{€ } 10 \text{ million}$		$\leq \text{€ } 10 \text{ million}$
micro	< 10	$\leq \text{€ } 2 \text{ million}$		$\leq \text{€ } 2 \text{ million}$

Table 3.16: EU Definition of Firm Size

The next three questions asks about company ownership (e.g. Irish, local operation of multinational company, other). Respondents were also asked about their professional backgrounds (i.e. end-to-end supply chain management, purchasing, production/operations management, transport management, warehouse management, customer service, other). These options are based on the “buy-make-move-store-sell” logic introduced earlier.

### ***3.8.6 Data Analysis Considerations***

Before the first draft of the questionnaire is pre-tested, as noted by Collis and Hussey (2009, p. 207) “it is important to consider at this stage how you will analyse your research data”. The following sections provide an overview of how the author intends to proceed in this regard for the data collected using each section of the questionnaire.

#### **Questionnaire Section 1: Background**

This part of the questionnaire relates mainly to RQ1 (i.e. “What is the level of understanding of SCM in practice?”). Analysis of these responses will, therefore, mainly use descriptive statistics and comparison with the findings from the focussed interviews (Chapter 4) and focus groups (Chapter 5). Content analysis will be used to analyse responses to the open questions. In relation to respondents’ opinions about the relationship between SCM and logistics, the data will be tested for significant differences between respondents based on: (i) sector; (ii) firm size; (iii) firm ownership;

and, (iv) respondent background. This will facilitate the creation of the profile based on the taxonomy of Larson and Halldorsson (2004). Similarly, responses to the other questions in this section that use Likert scales can also be tested for differences based on respondent demographics.

#### Questionnaire Section 2: SCM Objectives (*Fundamental One*)

The majority of the data gathered using this section will be tested for significant differences between respondents based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background. The one exception will be in relation to the importance of customer service in the markets served. In this case, it is the sector in which the firm is based that is likely to be the key determinant<sup>34</sup>.

#### Questionnaire Section 3: Supply Chain Integration (*Fundamental Two*)

Data collected using all five questions in this section will be tested for significant differences between respondents based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background. The extent to which external integration (i.e. integration with customers and suppliers) is predicated upon internal integration is also of interest. Correlation analysis will be used to assess the strength of these relationships. Correlation between the importance attached by respondents to different types of integration and the corresponding levels of integration (i.e. internal and external) can also be tested.

#### Questionnaire Section 4: Supply Chain Flow Management (*Fundamental Three*)

As with section 3, data collected using all four questions in this section will be tested for significant differences between respondents based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background. It was argued in Chapter 2 that the effective management of material and money flows is predicated upon the effective management of the related information flows. This can be tested using correlation analysis.

#### Questionnaire Section 5: Supply Chain Relationships (*Fundamental Four*)

As with sections 3 and 4, data collected using all three questions in this section will be tested for significant differences between respondents based on: (i) sector; (ii) firm size;

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<sup>34</sup> Given the addition of the “environmental sustainability” option in the question on SCM objectives as a direct result of the focus group research described in Chapter 5, particular attention will be paid to this data.

(iii) firm ownership; and, (iv) respondent background. In addition, the data can be checked for correlation between, on the one hand, “the nature and extent of relationships” (internally and with customer and supplier companies) and, on the other hand, “the extent to which supply chain activities are integrated” (internally and with customers and suppliers).

#### Questionnaire Section 5: Supply Chain Improvement

This part of the questionnaire relates mainly to RQ4 (i.e. “What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?”). Analysis of these responses will, therefore, mainly use descriptive statistics and comparison with the qualitative research described elsewhere in this thesis. Data collected using the “yes/no/don’t know” questions in this section can also be easily tested for significant differences between respondents based on one of more of: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background.

#### Cross-Sectional Analysis

This section extends the focus to relationships between variables across different sections of the questionnaire – *cross-sectional analysis*. Three issues are of particular interest in this context:

1. the relationship between different types of SCI and the manner in which information flows are managed (given the concept that integration is predicated upon effective information management);
2. the relationship between different types of SCI and the use of ICT tools (given the role often attributed to ICT as an enabler of SCI); and,
3. relationships between different types of SCI and the strength of different types of customer/supplier relationships.

Where significance testing is used, dependencies are considered to be: highly significant (VS) where  $p \leq 1\%$ ; significant (S) where  $1\% < p \leq 5\%$ ; slightly significant (LS) where  $5\% < p \leq 10\%$ ; and, not significant (NS) where  $p > 10\%$ . Factor maps of the cross tabulations – based on the approach known as *correspondence analysis* – will also be used to illustrate the relationships between variables. In particular, this allows the factors that contribute most strongly to statistically significant relationships between demographic and other variables to be identified. As opposed to traditional hypothesis testing designed to verify a priori hypotheses about relationships between variables, this

form of exploratory data analysis is used to identify systematic relationships between variables when there are no (or incomplete) a priori expectations as to the nature of such relationships.

A factor map is a diagram, representing the distribution of two, or more, closed variables according to two factors. SphinxSurvey<sup>TM</sup> (the author's chosen survey tool – see section 3.8.8) automatically selects the two strongest factors (those explaining the greatest percentage of the variance) to be displayed on the map. The variance explained by each factor is given in brackets by the axis title. The factor map offers a visual way of presenting findings from cross tabulations. All interpretations could equally be made from observing the cell values in the table. However, with a factor map, the key relationships between variables can be quickly and intuitively identified. The proximity of items reflects the degree to which they are associated – the closer the points, the closer the relationship.

Phillips (1995) reported that the use of this form of analysis “has been relatively little used in social science research in the UK and the USA” and that “this is surprising, considering how popular the technique is elsewhere”.

### ***3.8.7 Draft Questionnaire Pre-testing***

As shown in Figure 3.13, the draft questionnaire then needs to be pilot tested to ensure that respondents will not have any problems in answering the questions, thus providing a basis for questionnaire refinement as required. Various scholars have proposed a number of quite similar approaches with regard to this stage of the process but that of Robson (2002) is set out in a logical and step-by-step manner.

He suggests that “the draft questionnaire is best pre-tested informally, initially concentrating on individual questions” (p. 254). This was carried out by colleagues and friends who provided useful feedback in relation to the clarity of individual questions. Robson (2002) then suggests that “a second stage uses respondents from the groups of interest” (p. 254). The author used one of the focus groups (see Chapter 5) for this purpose. This again provided some useful feedback in terms of individual questions, as well as in relation to the overall structure of the questionnaire. Finally, Robson (2002) suggests that “a formal pre-test can now be run as a miniature pilot version of the real thing” (p. 254) and suggests that at least 20 respondents should be aimed for. This has

been carried out by the author. The stages in questionnaire refinement are set out in Figure 3.19 (below).

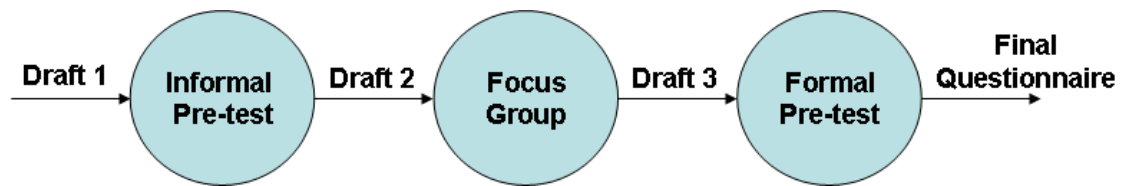


Figure 3.19: Questionnaire Refinement Process

This refinement process resulted in some relatively minor amendments to the questionnaire. These amendments mainly involved making the language used somewhat clearer and ensuring that some of the features of the chosen software (SphinxSurvey™) – particularly the “skip-logic” – were used consistently (see section 3.8.8 below). One question based on Q4D in Table 6.11 – “Does your company formally appraise supply chain investment opportunities?” – was omitted from the final questionnaire as many of those consulted during the various pre-test stages found it excessively broad in scope to give a response with which they were comfortable. In relation to some of the questions where an opinion was solicited on a statement (for example, question 5 asks respondents for their views on the statement: “The language and terminology used to define SCM contributes to confusion in understanding”) a number of respondents expressed the view during the formal pre-test that they found these questions somewhat leading. The author decided to retain these questions given that: (i) the questions relate to issues of importance in the context of the overall research questions; and, (ii) responses are solicited using a Likert scale thereby providing respondents with a range of possible plausible options. Nonetheless, at the analysis phase of the research particular attention will be paid to any issues that may arise in relation to these questions.

The final questionnaire (see Appendix 11) comprised 30 questions across six sections, as well as those that relate to demographic and control information.

### ***3.8.8 Final Design and Planning***

Robson (2002) suggests that the main task at this stage is editorial. However, there are final decisions to be made about: (i) distribution method; (ii) the accompanying letter; and, (iii) handling non-response bias.

### Distribution method

In terms of a distribution method, three broad approaches were considered: postal questionnaire; distribution of questionnaire by email; and, web-based questionnaire. Each has its own advantages and disadvantages. It was decided to use the web-based approach. This involves locating the questionnaire on a web site, with each respondent being sent the web address to access it. The survey is then completed online with responses stored directly in an online database for statistical processing. Survey design and analysis software packages such as SphinxSurvey<sup>TM</sup>, Snap<sup>TM</sup> and SurveyMonkey<sup>TM</sup> support this process. The many advantages of web-based surveys have resulted in their use becoming very common. It was the chosen approach for the current survey for various reasons, including:

1. Professional-looking questionnaires can be developed using the software, with pop-up and drop-down menus providing explanations where necessary;
2. “Skip-logic” enables the skipping over of topics that are not relevant based on answers to earlier questions;
3. Speedy responses are facilitated; and,
4. Responses are directly input into a database for analysis, thus avoiding transcription errors.

For SCM and logistics research specifically, Grant et al. (2005) highlighted the interactivity aspect as a key advantage (similar to point 1 above). They also noted the potential benefit afforded to the researcher as a result of having the “opportunity to analyse the response behaviour during completion due to time-data recording during the completion process by every respondent” (p. 151). There are of course potential drawbacks associated with web-based approaches, particularly in relation to low response rates. However, the author’s review of previous SCM empirical research (see Appendix 7) indicates that those studies which specifically reported the use of email or web-based surveys had response rates between 9.4% (Wu et al., 2006) and 26.3% (Ketikidis et al., 2008). This is relatively high given some of the challenges associated with administering surveys of this kind (as outlined by Grant et al., 2005).

The tool chosen was SphinxSurvey<sup>TM</sup>. This provides a range of facilities that support the design of questionnaires. The associated website ([www.sphinxonline.net](http://www.sphinxonline.net)) then hosts the questionnaire and provides a range of statistical analysis techniques from simple descriptive statistics to significance testing and correlation/regression analysis. It also

allows open questions to be analysed by recoding responses to automatically calculate lexical structures.

#### Accompanying letter

The next stage involves writing an accompanying letter (for a postal questionnaire) or some other appropriate means (for example, for web-based questionnaires) to put the survey into context for respondents. Given that the chosen distribution method is web-based this letter is essentially the email containing the Internet URL of the website that hosts the questionnaire (see Appendix 12). This email was designed to establish research credibility, provide some background to the research project, set out the response deadline, assure respondent confidentiality, and offer to send participants a copy of survey results as an incentive. In addition to the letter, the introductory section in the main body of the questionnaire sets out some guidelines for completion of the survey.

#### Non-response strategy

An obvious potential disadvantage associated with the use of questionnaire surveys is their low response rates. It is important that those who do respond are representative of the population being researched. As Easterby-Smith et al. (2008) put it:

In itself though, non-response is not a problem, as long as those who do respond have the same characteristics as those who do not. Of course, there is usually a big problem in assessing whether this is true, because (obviously) non-respondents did not respond (p. 213).

However, there are well established techniques for assessing the impact of non-response bias. Some of these involve comparing those who respond quickly with relatively late respondents (on the basis that the latter are likely to share certain characteristics with non-respondents). Others involve ensuring that those who do respond are representative of the wider population under study in relation to variables such as company size, sector and location.

### **3.9 Summary and Some Concluding Points**

This chapter has set out the proposed overall research design to be adopted in answering the four research questions posed. It has done so with reference to:

- the philosophical issues discussed in section 3.2;

- the methodological issues discussed in section 3.3; and,
- a range of possible research methods and techniques (as discussed sections 3.4).

The overall research design (section 3.5) has been informed by the guidance provided by Fawcett et al. (2011) in a recent editorial in the *Journal of Business Logistics* (p. 115):

To add real value and make a real contribution, we must conduct research that goes beyond merely talking about organizational performance. Our research must help decision makers improve performance. As we discover specific knowledge and ultimately synthesize that knowledge into a higher level of integrated understanding, we can expect two important outcomes: 1. We will advance the frontiers of the logistics and supply chain disciplines, helping improve corporate performance and societal well-being. 2. We will find that the business school's ugly stepdaughter has grown up - and that she is not just wearing Cinderella's glass slipper but she also has a key to the C-suite.

The "business school's ugly stepdaughter" is a reference to early perceptions of logistics research in the wider business research community. These points are relevant in the context of the current research as the work is intended to (see section 3.3.7): be of practical value to practitioners and policy-makers by providing a detailed understanding of the current SCM landscape in Ireland; and, contribute in a meaningful way to the further development of critical SCM theory across the range of domains addressed.

Sections 3.6, 3.7 and 3.8 then set out the detailed design of the three main phases of the empirical part of this research – the remaining chapters of this thesis describe in detail the findings from each of these three components. For example, the next chapter (i.e. Chapter 4) goes on to describe how focussed interviews were used to generate specific insights into practitioner understanding of the phrase "supply chain management" and the word "logistics".



## CHAPTER 4

### PHASE I: FOCUSSED INTERVIEWS

#### 4.1 Background and Introduction

As noted in Chapter 2, a plethora of supply chain management (SCM) and logistics definitions, and an associated range of often quite complex language and terminology, have been developed in recent years. As noted in section 3.6.1, the focus of this part of the research is on gaining deep insights into practice, particularly in relation to the fundamental issue of how practitioners define the key words and phrases (i.e. *supply chain management* and *logistics*). A series of semi-structured (i.e. focussed) interviews with key informants will provide data to:

- i. assess the level of understanding of practitioners, specifically in relation to the use of the phrase *supply chain management* and the word *logistics*; and,
- ii. build upon and refine the *Four Fundamentals* construct.

As further noted in section 3.6.1, it is to a large extent a replication of the work of Lummus et al. (2001).

The structure of this Chapter is shown in Figure 4.1 (below). Following this introduction, it provides an overview of the evolution of SCM and logistics, as well as of the relationship between them (section 4.2). It goes on to look at current practitioner views of the terms based on a small scale survey which involved interviewing managers from two manufacturers, two third party logistics (3PL) providers / distributors and two retailers. Section 4.3 presents an analysis of the data collected during the interviews leading to a discussion of the main results in section 4.4 across the eight areas shown in Figure 4.1. Some concluding comments are made in section 4.5.

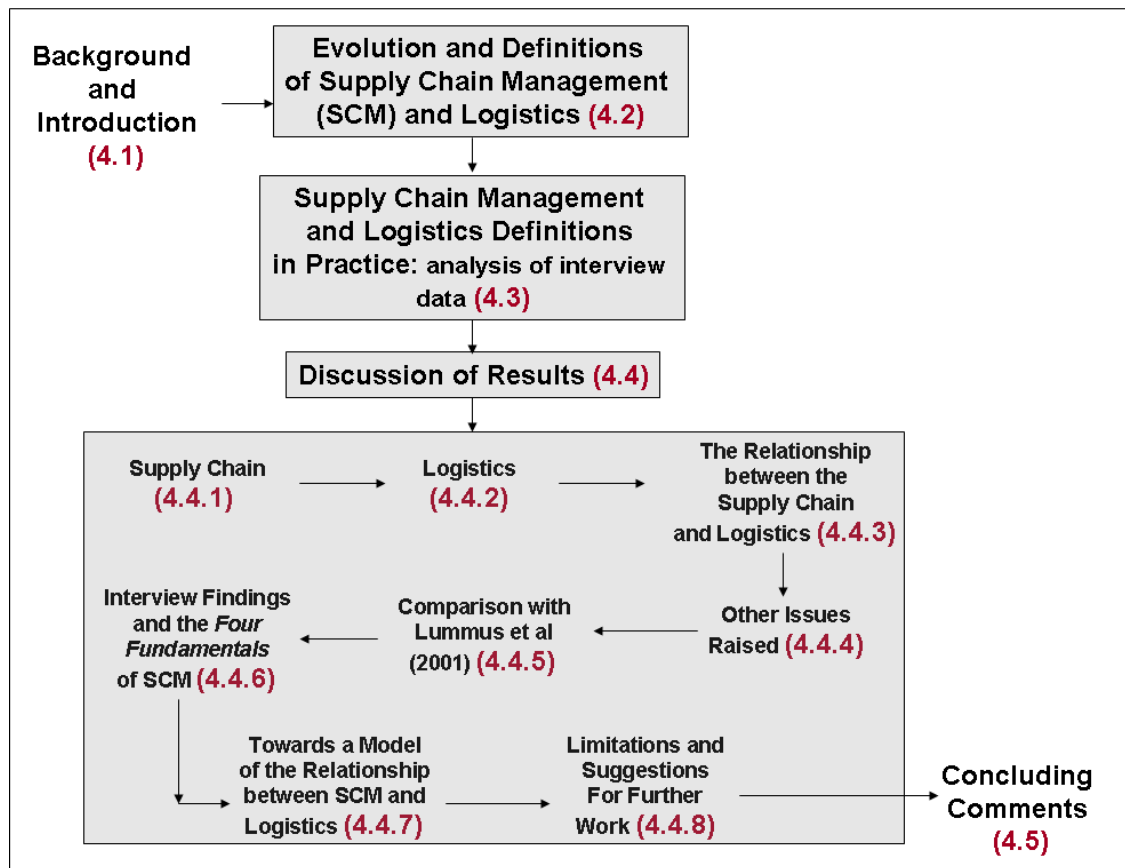


Figure 4.1: Structure of Chapter 4

## 4.2 Evolution and Definitions of SCM and Logistics

As noted in Chapter 2, the term SCM was originally introduced by management consultants in the early 1980s (Oliver and Webber, 1982) and since then several attempts have been made to place contemporary SCM thinking in an historical context and/or to plot its historical development and evolution (see, for example: Masters and Pohlen, 1994; La Londe, 1994; Christopher and Towill, 2000; Lummus and Vokurka, 1999). One particularly instructive perspective was provided by Battaglia (1994) and is shown in Figure 2.4. It indicates that the evolution of SCM has involved a shift from highly fragmented to much more integrated approaches with the 1990s characterised as the decade of “Total Integration”.

The concept of logistics has existed for centuries with most early references to the concept being found primarily in military applications. Dictionary definitions of logistics also tend to emphasise the military context. Lummus et al. (2001) discuss logistics in the contexts of the construction of the great pyramids, the expansion of

Europe to the Americas and the two World Wars. Over time the application of logistics has moved into the mainstream business arena. As with SCM, numerous definitions of business logistics have been proposed. Most refer to the physical movement and storage of materials.

There are a number of different schools of thought in relation to the relationship between SCM and logistics. As noted by Lummus et al., (2001), “What is not always clear is how logistics differs from ... supply chain management” (p. 426). Similarly, Larson and Halldorsson (2004) point out that there was lack of agreement on how SCM is related to logistics. They go on to identify four conceptual perspectives on SCM versus logistics: *traditionalist*, *re-labelling*, *unionist* and *intersectionist*. Their schematic representation of the perspectives contained in their paper is shown in Figure 2.21. Whilst each of these approaches is valid in its own way, the authors’ research indicates that the unionist view – in which logistics is regarded as part of SCM – is the most widely adopted by scholars. The empirical evidence of Lummus et al. (2001) suggests a similar perspective amongst practitioners.

As noted in section 2.13.1, the *Four Fundamentals* could be regarded as “unionist intersectionist” in the Larson and Halldorsson (2004) framework. It is unionist in that it does view logistics as one element of the wider SCM field. Logistics, with its primary focus on the effective and efficient movement and storage of materials, plays a critical role as part of *Fundamental Three*. Nonetheless, the strategic and integrative role assigned to SCM by the intersectionist perspective is in line with the *Four Fundamentals*, in particular *Fundamental Two*. The concept of using SCM as a source of strategic leverage, as discussed earlier, is in line with this view. This relates directly back to the need for clear SCM objectives – as articulated in *Fundamental One* – which link directly with the overall corporate mission and objectives of an organisation.

#### **4.3 SCM and Logistics Definitions in Practice: analysis of focussed interview data**

As noted in section 3.6, this component of the research involved conducting interviews with a small sample of key informants. The sample comprises two manufacturers, two third party logistics (3PL) providers / distributors and two retailers. All interviews were recorded and transcribed. In relation to the analysis of interview transcripts, Easterby-Smith et al. (2008) describe two approaches: content analysis and grounded analysis.

The former involves interrogating the data for constructs and ideas that have been decided in advance. Examples of this are the direct comparison with Lummus et al. (2001) in section 4.4.5, and the author's cross-mapping of the findings with the *Four Fundamentals* (see section 4.4.6). The latter involves letting the data "speak for itself" thus allowing for more intuition in guiding the researcher towards an understanding of the data. The identification of "other issues raised" (see section 4.4.4) is an example of this. In this way, the author's approach involves a combination of both approaches, thus integrating the strengths and mitigating the shortcomings of the two alternatives.

The transcript analysis employed by the author (as shown in Figure 4.2) involved four main stages in distilling the raw transcript data into information that was analysed based on comparing and contrasting the main issues set out by respondents. Stage 1 reflects the advice of Robson (2003) that good transcript analysis has to be aimed squarely at answering the research questions asked or addressing the overall research objectives. Stage 2 reflects the fact that repeated use of a particular word or phrase by a single respondent can not be logically considered to imply that the concept in question is necessarily of particular importance beyond the specific environment in which that respondent is based. A considerable amount of time was spent during the interviews in clarifying terms used by respondents to ensure that the author was absolutely sure of the intended sense of the terminology used. This is particularly important in the SCM field where a large number of metaphors are used to describe concepts. Stage 3 (essentially a two-stage "filtering" process) addressed this issue and was carefully considered during the planning and execution of the interviews. The final stage involves the analysis of data based on comparing (i.e. identifying key elements of similarity or convergence) and contrasting (i.e. identifying key elements of difference or divergence) the main issues set out by respondents.

The results are summarised in Table 4.1 and indicate the use of a variety of emphases and approaches amongst practitioners. Interviewees were invited to provide feedback on this summary to ensure that it was an accurate reflection of the discussion that took place. Minor modifications were made to the summary based on this feedback.

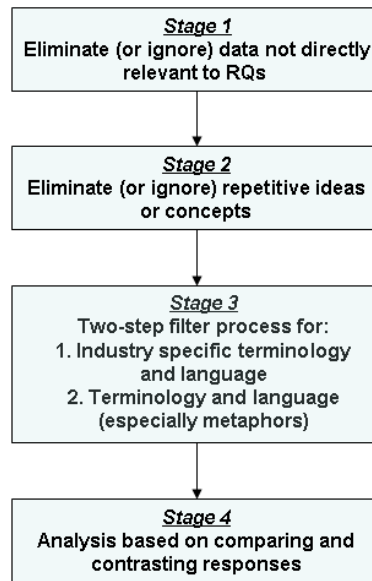


Figure 4.2: Transcript Analysis Process

## 4.4 Discussion of Results

### 4.4.1 Supply Chain

Most respondents regard the supply chain as a network of companies with Manufacturer 1, Manufacturer 2 and Retailer 2 making specific use of the word “network”. Retailer 2 spoke of a “network of activities” rather “network of companies” but the distinction is immaterial given the online nature of this business. 3PL1 used the word “pathway” to describe the network. Retailer 1 drew a distinction between internal (i.e. intra-firm) and external (i.e. inter-firm) supply chains. Interestingly, the latter was deemed to be “of little or no importance to our day to day operation”. There was a sense that once the supply chain fulfils its role in terms of ensuring on-shelf availability (OSA) the detail of how it is configured and managed is unimportant. Finally, 3PL2’s orientation is based on the logic of a “buy-make-move-sell” network.

**Firm**

How do you define supply chain?

How do you define logistics?

How are these areas related?

<b>Manufacturer 1</b>	<p>Supply chain is the network of all organisations which influence the reliable and cost effective delivery of the product or service from the initial raw material(s) to the end consumer.</p> <p>Supply chain management is the coordination of the individual processes which manage the flow of material, money and information through a network of companies acting in partnership so that the overall outcome meets or exceeds customer needs while minimising costs throughout the entire chain.</p>	<p>Logistics is the process of efficiently managing the flow of material between links along the supply chain. It includes the transportation and storage of raw material, work in process and finished goods from the ultimate supplier to the ultimate customer. It may also include the return flow of material through the supply chain for repair or disposal.</p>	<p>Logistics is a subset of supply chain management. If we take the earlier definition of supply chain management as being concerned with the flow of material, money and information through the supply chain then logistics is the execution phase of the flow of material. Without efficient logistics then the supply chain will fail to meet customer needs in a cost effective manner. But without efficient supply chain management controlling the other flows of information and money then logistics will fail to deliver the right products at the right time to the right place at the right cost.</p>
<b>Manufacturer 2</b>	<p>The supply chain is the network of companies (customers and suppliers) through which the product passes 'from the farm to the fork'. It includes farmers, suppliers, processors, wholesalers, retailers (and others).</p>	<p>Logistics is physical distribution management. It is concerned with movement and storage of products in the supply chain.</p>	<p>Management of the supply chain is an aspirational and theoretical notion. It is about 'end to end pipeline management' which is not practical. In practice, SCM is about managing relationships with key customers and suppliers. Logistics is about 'trucks and sheds', i.e. management of warehouse and transport operations.</p>
<b>3PL/Distributor 1</b>	<p>Supply chain is the pathway from cradle to grave of products, cradle being start of process i.e. order placement of finished product or sourcing of raw material for manufacturing etc, grave being end of process i.e. satisfactory receipt of invoiced product or manufactured product ready for sale.</p>	<p>The processes used in the supply chain to realise the required result make up logistics. Source, transport, information, manufacture, store etc. Each process is a stand alone unit in its own right but must also interface with other processes to ensure effectiveness of supply chain.</p>	<p>Logistics are the mechanics or tools which ensure the effectiveness of the supply chain, i.e. for products to move from source to end user they will move along the supply chain by way of logistics process (operations). The use of these processes as stand alone units and also how they interface with each other will determine the effectiveness of the supply chain.</p>
<b>3PL/Distributor 2</b>	<p>Supply chain is the series of linkages that bring stock or value from the base raw material to the end customer. These linkages traditionally would be the buy, make, move, sell steps to the end customer.</p> <p>Supply chain management focus on maximising flows of stocks and services through the chain by improving the flow of information and cash through the chain.</p>	<p>Logistics as the process of moving stock from point to point along the chain. This process could involve the use of transport and warehouses. Logistics is quite mechanical in that it is instruction i.e. move stock from A to B.</p>	<p>Logistics is a subset of the supply chain, in that it focused solely on the storage and movement part of the supply chain. Logistics is the mechanical element of moving and storing in the buy, make move, store sell model. However, where it differs from supply chain is that logistics does not take account of maximising the information flows or cash flows within the chain. Logistics does not seek to find the weakest link in the chain with a view to improving it.</p>

Table 4.1: Practitioner Definitions

<b><u>Firm</u></b>	<b>How do you define supply chain?</b>	<b>How do you define logistics?</b>	<b>How are these areas related?</b>
<b>Retailer 1</b>	Our primary focus is selling, so from a retail sector perspective (the external) supply chain has little or no relevance to our day to day operation. Being face to face with the customer (end user) our only concern is having the goods available as and when we need them – we are not overly concerned with how products are produced or in the difficulties that may ensue in getting them to us – just so long as we get them on time; if a supplier fails to deliver generally we have no difficulty finding an alternative source.  Of greater concern to us is the internal supply chain and how goods / services are managed within our store environment, that is from receipt of stock from suppliers to the delivery / hand over to our customers.	The internal planning, execution and control of the movement and placement of people and/or goods which results in our customers receiving the products they require.	Within retail operations they could be classified as being one and the same thing.
<b>Retailer 2</b>	In this type of retail business, a supply chain represents the network of interconnected activities from getting raw materials (such as the mining of diamonds, gold, culturing of pearls, etc) transformed into finished pieces of jewellery that are then sold to end-consumers. This usually encompasses discovering and buying raw materials and energy, moving (and at times selling) them to manufacturing locations, transforming them into finished products, storing and selling them. A supply chain can furthermore consist of goods, services, information, resources and money	Logistics in this business can be defined as to the operational aspects of transforming unfinished products into finished goods and to getting finished or unfinished products to a desired location in a predefined time span and to a certain cost level.	A supply chain is the actual network of interrelated activities from getting a raw material into a finished product including the associated flow of information, money etc., whereas logistics is rather the operational management aspect of a supply chain with regards to getting a product, service, information or resources from A to B.

Table 4.1 (continued): Practitioner Definitions

Several respondents make reference to the management of flows:

- Manufacturer 1 notes the need for “coordination of the individual processes which manage the flow of material, money and information”;
- 3PL2 notes that SCM has a “focus on maximising flows of stocks and services through the chain by improving the flow of information and cash through the chain”; and,
- Retailer 2 refers to the flow of “goods, services, information, resources and money”.

Finally, several respondents make specific reference to the objectives of SCM. For example, Manufacturer 1 suggests that “the overall outcome meets or exceeds customer needs while minimising costs throughout the entire chain”.

#### ***4.4.2 Logistics***

Most respondents consider logistics to be concerned primarily with the movement and storage of product. Manufacturer 1 specifically uses logistics as a synonym for physical distribution management. 3PL1 took a broader view with activities such as sourcing, information management and manufacturing regarded as part of logistics. Interestingly, Retailer 1 made explicit reference to the movement of people, along with the movement

of product, in line with some of the original military and dictionary definitions of logistics. In other words, the key focus of most interviewees was on the forward movement of materials through the chain, as well as on storage.

Just one respondent (Manufacturer 1) alluded to reverse logistics – “It (i.e. logistics) may also include the return flow of material through the supply chain for repair or disposal”. The focus of this company on reverse logistics issues is perhaps not surprising given its growing importance in the electronics sector as a result of legislative pressures and environmental imperatives. The focus of all other respondents was entirely on forward flows.

The paper of Lummus et al. (2001, p. 431) concluded that “logistics is generally viewed as within one company”. This internal view is evident in the comment of Retailer 1 that logistics is primarily concerned with “internal planning, execution and control”.

#### ***4.4.3 The Relationship Between the Supply Chain and Logistics***

Both Manufacturer 1 and 3PL2 regard logistics as a “subset” of SCM. This is in line with the “unionist” perspective of Larson and Halldorsson (2004). Both 3PL respondents speak of logistics being concerned with the “mechanics” of SCM. Similarly, Manufacturer 1 regards logistics as “the execution phase of the flow of material” and Retailer 2 describes logistics as the operational aspect of SCM. These views are in line with the “intersectionist” perspective of Larson and Halldorsson (2004).

Interestingly, Manufacturer 2 regards conventional definitions of SCM as “aspirational”. This is in line with the point made by Storey et al., (2006) when they asked “who is responsible for managing these (SCM) activities?” They went on to note that:

Just because supply chains may exist it does not necessarily follow that they are actually managed. Even if they are managed in parts, it does not necessarily mean that they are managed across the whole spectrum. (p. 761)

The firm view of Manufacturer 2 is that in practice SCM involves the management of key upstream and downstream dyadic nodes and that anything else is nothing more than “a theoretical notion”. This reflects the widely held view that there is significant divergence between the theory and practice of SCM (see section 2.15.2). Nonetheless,



this approach places this respondent very much in the “unionist” school of thought in that SCM is seen as being much broader than logistics. Finally, Retailer 1 suggests that SCM and logistics are “one and the same thing”. In other words, just one of the six interviewees adopts an approach that is in line with the “re-labelling” perspective of Larson and Halldorsson (2004).

#### ***4.4.4 Other Issues Raised***

Many other issues were raised by respondents during the course of the interviews. The majority of these issues are industry and/or company-specific. For example, Retailer 1 suggested that its relative power over suppliers is such that partnership relationships based on trust are not deemed to be necessary. One significant issue raised by a number of respondents relates to the importance of skills and knowledge development in SCM and logistics. This issue was strongly emphasised by 3PL1:

“The supply chain and its mechanics (i.e. logistics operations) is widely misunderstood. The learning process for this subject, in my opinion, should begin at an early age”.

This raises issues in relation to the importance of SCM and logistics education and training, particularly in the light of developments in supply chain learning. Supply chain learning (Bessant et al., 2003) is based on firm-to-firm exchange of knowledge, i.e. leveraging the supply chain as a mechanism to enable learning and competence development (see section 2.11.5).

#### ***4.4.5 Comparison with Lummus et al. (2001)***

Given the small-scale nature of the current study and of Lummus et al. (2001), the resultant problems with generalisability make it difficult to make direct comparisons. Further, the lack of a detailed description of the methodological approach adopted in the earlier study makes exact replication impossible. Moreover, as stated by Tsang and Kwan:

In the replicated study there is a different set of contingencies that either modifies the postulated mechanisms or invokes previously inactive countervailing mechanisms (1999, p. 769).

Nonetheless, a number of points are worth highlighting.

Lummus et al. (2001) concluded that “there is general agreement on what logistics entails” (p. 429). A similar comment can be made in relation to the current study with

respondents regarding logistics as being largely concerned with the movement and storage of materials. The concept of logistics being concerned with the operational execution of SCM is another recurring theme across both studies.

In relation to SCM there is less convergence of opinion both between and within the two studies. Diversity of opinion as to what SCM entails is evident across all 12 respondents (i.e. six in the current and six in the earlier study). This reflects the specific challenges and developments in the sectors under consideration. However, there appears to be a somewhat stronger emphasis in the current study on external integration aspects of SCM. This could be an indication of progress in relation to internal aspects of integration over the decade.

Mentzer et al. (2001) suggested that supply chain orientation (SCO) – defined as the recognition by an organisation of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain – is a prerequisite for effective SCM in that it requires that SCO exists in several linked companies across a supply chain. In other words, attempts to build highly integrated inter-firm networks require that high levels of intra-firm integration are already in place. This element of the current study is perhaps a reflection of this point.

Finally, comparative analysis of the two studies does not reveal that practitioner perspectives have progressed significantly over the last decade and/or that geographical differences exist. However, larger scale surveys of opinion would be needed for hypotheses about such differences to be deductively tested.

#### ***4.4.6 Interview Findings and the Four Fundamentals of SCM***

Table 4.2 summarises the interview findings as they relate specifically to the *Four Fundamentals* of SCM (as described in Chapter 2). The transcript of each interview was analysed and the key words and phrases that most closely relate to each *Fundamental* were captured. Table 4.2 also indicates which of the four SCM/logistics perspectives of Larson and Halldorsson (2004) best describes the view of the respondent. Where a respondent adopted an approach which comprises elements of more than one of these perspectives then these are listed in order. For example, the perspective of Manufacturer 1 is primarily unionist in that it regards “logistics as a subset of SCM” but there are

elements of the intersectionist view in that “logistics is the execution phase” of SCM. The perspective is, therefore, classified as “unionist/intersectionist”.

	<i>Fundamental One</i>	<i>Fundamental Two</i>	<i>Fundamental Three</i>	<i>Fundamental Four</i>	Larson and Halldorsson (2004) Perspective
Manufacturer 1	<ul style="list-style-type: none"> <li>reliable and cost effective delivery of the product or service</li> <li>meet or exceed customer needs while minimising costs throughout the supply chain</li> </ul>	<ul style="list-style-type: none"> <li>network of organisations</li> <li>coordination of individual processes</li> </ul>	<ul style="list-style-type: none"> <li>flow of material, money and information</li> </ul>	<ul style="list-style-type: none"> <li>companies acting in partnership</li> </ul>	<ul style="list-style-type: none"> <li>unionist/intersectionist</li> </ul>
Manufacturer 2		<ul style="list-style-type: none"> <li>network of companies</li> </ul>		<ul style="list-style-type: none"> <li>managing relationships</li> </ul>	<ul style="list-style-type: none"> <li>unionist</li> </ul>
3PL/Distributor 1		<ul style="list-style-type: none"> <li>pathway from cradle to grave of products               <ul style="list-style-type: none"> <li>source, transport, manufacture, store, etc.</li> </ul> </li> </ul>		<ul style="list-style-type: none"> <li>process interface management</li> </ul>	<ul style="list-style-type: none"> <li>intersectionist/unionist</li> </ul>
3PL/Distributor 2	<ul style="list-style-type: none"> <li>maximising flows of stocks</li> <li>improving the flow of cash</li> <li>creating value</li> </ul>	<ul style="list-style-type: none"> <li>series of linkages from raw material to end customer</li> <li>buy, make, move, sell</li> </ul>	<ul style="list-style-type: none"> <li>flow of stocks, services, information and cash</li> </ul>		<ul style="list-style-type: none"> <li>unionist/intersectionist</li> </ul>
Retailer 1	<ul style="list-style-type: none"> <li>on time delivery</li> </ul>	<ul style="list-style-type: none"> <li>receipt of stock from suppliers to handover to customers</li> </ul>	<ul style="list-style-type: none"> <li>placement of people and/or goods</li> </ul>	<ul style="list-style-type: none"> <li>supplier partnerships</li> </ul>	<ul style="list-style-type: none"> <li>re-labelling</li> </ul>
Retailer 2	<ul style="list-style-type: none"> <li>meeting predefined delivery targets</li> <li>logistics costs</li> </ul>	<ul style="list-style-type: none"> <li>network of interconnected activities</li> <li>sourcing, buying, moving, making, storing and selling</li> </ul>	<ul style="list-style-type: none"> <li>goods, services, information, resources and money</li> </ul>		<ul style="list-style-type: none"> <li>unionist/intersectionist</li> </ul>

Table 4.2 Interview Findings and the *Four Fundamentals*

In relation to *Fundamental One* (objectives), four or the six respondents made reference to service and/or cost objectives. The approach of Manufacturer 1 most closely matches *Fundamental One*. Five of the six respondents recognise the existence of the external (i.e. inter-firm) supply chain and the implicit desirability of holistically managing it. This is central to *Fundamental Two*. The other – Retailer 1 – has a strong focus on management of the internal (i.e. intra-firm) chain of activities. It is also interesting to note that at least three respondents made specific reference to the “buy-make-store-move-sell” model (or at least to a variation on that theme). The majority of respondents stated that the management of flows was an integral element of SCM. *Fundamental Three* refers specifically to the management of material, money and information flows. Some respondents took a somewhat broader view – for example, Retailer 1 suggested that people movement was a key flow that needed to be managed. Four of the six respondents made specific reference to relationship issues – the essence of *Fundamental Four*. Of these, two (Manufacturer 1 and Retailer 1) made specific reference to the partnership concept.

In Chapter 2, the author claimed that the *Four Fundamentals* represents an attempt to concisely, yet comprehensively, define the essence of SCM, and that it is aimed primarily at a practitioner audience and aims to bring clarity and understanding to the issue. Cross-mapping the responses of the interviewees with the *Four Fundamentals* (see Table 4.2 above) provides some confidence that these aims have been met. No

respondent made any statement which contradicted or invalidated the construct in any way. In point of fact and recognising that sector-specific and company-specific issues make the development of a generic definition difficult, the approach described by all respondents is broadly in line with the *Four Fundamentals*. Moreover, some respondents' (notably Manufacturer 1) approaches are virtually indistinguishable from the essence of the construct.

In terms of the Larson and Halldorsson (2004) perspectives, the predominant approach observed is unionist or intersectionist. As noted in section 2.13.3 the *Four Fundamentals* could be regarded as “unionist intersectionist” in nature: in other words, the majority of respondents adopted an approach which is broadly in line with the author's construct insofar as the relationship between SCM and logistics is concerned. The exceptions are Manufacturer 2 and Retailer 1, The former – classified as purely unionist – appeared to have a good knowledge of SCM principles and concepts but regarded them as “theoretical” and “aspirational”. The latter, which regarded SCM and logistics as “one and the same thing”, also appeared to have a good knowledge of SCM principles and concepts but regarded them as being of “little or no relevance” as a consequence of the firm's dominant position in the supply chain.

#### 4.4.7 Towards a Model of the Relationship Between SCM and Logistics

In line with the *Four Fundamentals* of SCM and based on the research described above, the author proposes a model depicting the relationship between SCM and logistics. This is shown in Figure 4.3.

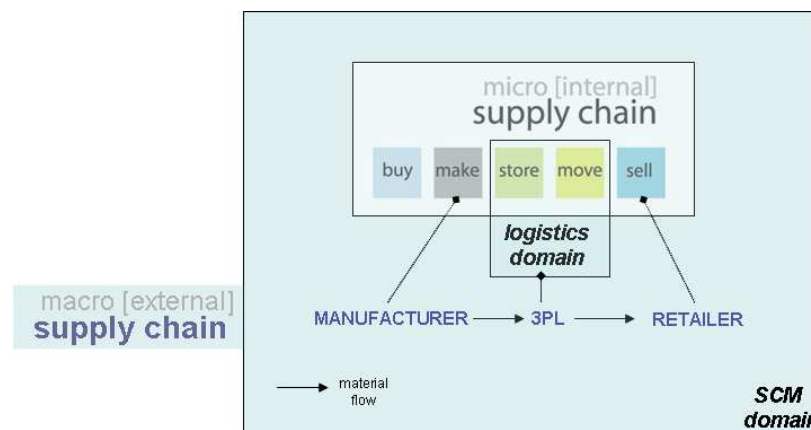


Figure 4.3: The SCM and Logistics Domains

A number of features of this model are noteworthy. Firstly, it is based on distinguishing between the internal (or micro or intra-firm) supply chain and the external (or macro or

inter-firm) supply chain. The former is based on the “buy-make-store-move-sell” model. The latter represents the flow of material between firms which comprise the supply pipeline.

The “buy” link (embracing sourcing, purchasing and procurement of products and services, as well as activities related to supplier development and supplier relationship management) in the internal supply chain is specifically deemed not to be part of the “logistics” domain. This reflects the feedback from all but one of the interviewees. It also reflects much of the literature. For example, Tan (2001) illustrates the evolution of SCM from both a purchasing and supply perspective, as well as a transportation and logistics perspective, and suggests that the SCM literature has developed along these two quite separate paths. However, activities that specifically relate to the procurement of transportation and logistics services specifically are considered part of the “logistics” domain.

The “make” link embraces all supply chain activities that take place within manufacturing environments. These include issues related to manufacturing strategy such as plant layout and make-versus-buy decision making (Hill, 1999). It also includes production planning and control issues, particularly production scheduling and factory inventory control (Chapman, 2005). Indeed, many of these activities could be regarded as falling under the “manufacturing logistics” heading (Wu et al., 1997). Nonetheless, in the author’s model the “make” link is specifically deemed not to be part of the “logistics” domain. As with the “buy” link, this reflects the feedback from all but one of the interviewees (Manufacturer 1), as well as much of the literature.

In the author’s model, the “sell” link is the stage in the supply chain where a product changes ownership as a result of a commercial transaction, usually between a retailer and a customer. It is at this point that the product assumes value from a customer perspective; indeed, the commercial transaction is indicative of the customer’s perception of that value. The field of “retail logistics” is concerned with all of the supply chain activities that result in a customer being in a position to purchase a product in a retail outlet (Ferne and Sparks, 2004). In addition, there are a range of logistical activities that typically take place within a retail outlet. For example, Retailer 1 referred to “the internal planning, execution and control of the movement of goods” (see Table 4.1). Notwithstanding this, the great majority of feedback from interviewees reinforces

the perspective adopted in much of the literature that the “sell” link in this context, while undoubtedly a critical SCM activity, lies outside the specificity of the “logistics” domain.

For simplicity of illustration the position of the three types of companies interviewed as part of the current research is indicated. In reality, the external supply chain will in most cases resemble a network of companies rather than a linear chain. This is analogous to the distinction between “chain level” (i.e. a series of dyadic relationships) and “network level” proposed by Harland et al. (1999). In line with the general view of companies interviewed for this research, the logistics domain is classified as embracing only the “store” and “move” links in the micro chain. The SCM domain is much broader, including as it does the planning and control of material and other flows through the macro chain. In this way, the model adopts the “unionist” perspective of Larson and Halldorsson (2004). Furthermore, the model indicates the relative breadth and scope of SCM which tacitly represents its primarily strategic and integrative nature. In this respect, the “intersectionist” perspective of Larson and Halldorsson (2004) is incorporated. In line with the *Four Fundamentals* of SCM and based on the analysis of the interviews described above, this model might best be described as “unionist-intersectionist”.

#### ***4.4.8 Limitations and Suggestions for Further Work***

There are some limitations in this phase of the research as a direct consequence of the methodology adopted. Other elements of the overall research design aim to address these limitations. This discussion of the limitations is based on issues of reliability and validity in qualitative research in management research generally, as well as in logistics/SCM research specifically.

In reflecting on the validity and reliability of this research, the qualitative criteria recommended by Lincoln and Guba (1985) have been adopted. They suggested that the key criteria for judging qualitative research are:

1. Credibility (analogous to internal validity in quantitative research, with Collis and Hussey (2009, p. 65) defining validity as “the extent to which the research findings accurately reflect the phenomena under study”);
2. Transferability (analogous to external validity in quantitative research);

3. Dependability (analogous to reliability – defined by Collis and Hussey (2009) as “the absence of differences in the results if the research is repeated” (p. 64) – in quantitative research); and,
4. Confirmability (analogous to objectivity in quantitative research).

Perhaps surprising, a recent paper on the use of focus groups in logistics research (Sanchez Rodrigues et al, 2010) pointed out that “in the logistics research community, there is an apparent lack of awareness of qualitative criteria in the evaluation of research methods” (p. 89). The following sections note how these criteria were addressed in the current research, as well as how deficiencies identified through consideration of these criteria can be addressed in future work in this area.

The credibility criterion involves establishing that the results of qualitative research are credible or believable from the perspective of the participants in the research. Whilst there is room for improvement in this area in the research described in this chapter, this issue was addressed to some extent by inviting interviewees to comment on summaries of the research findings. In any case, qualitative data such as that generated using focussed interviews are often highly credible in comparison with quantitative data generated using, for example, large scale surveys.

Transferability refers to the degree to which the results of qualitative research can be generalized or transferred to other contexts or settings. As noted earlier, the small sample used in the current research is not intended to be definitive and generalization is difficult. However, the focussed interview methodology employed enabled the validity of the *Four Fundamentals* construct to be assessed (see Table 4.2) and the proposed model of the relationship between SCM and logistics (see Figure 4.3) to be developed inductively. This process of relating the empirical findings back to the literature helped in this regard. The next stage of the work is to empirically test this model using a larger survey of firms.

The idea of dependability emphasizes the need for the researcher to account for the changing context within which research occurs. The researcher is responsible for describing the changes that occur in the setting and how these changes affected the way the researcher approached the study. In this regard, the author fully documented the whole focussed interview process, from design through to analysis and feedback.

Confirmability refers to the degree to which the results could be confirmed or corroborated by others. The research described in this chapter is part of a larger project that is based on methodological triangulation, i.e. the focussed interviews represent just one aspect of a wider research design (see Figure 3.5). The combined inductive/deductive approach involves the integrated use of:

- focus groups in phase II (to further refine the *Four Fundamentals* construct as part of answering RQ1 – see Chapter 5);
- a questionnaire survey in phase III (to assess the current level of SCM adoption as part of answering RQ2 – see Chapter 6); and,
- a variety of other approaches to inductively address RQ3 and RQ4.

#### **4.5 Concluding Comments**

The author recognises the profusion of definitions of, and approaches to, SCM and logistics in practice. The intent of this chapter is to clarify understanding of the activities embraced by each and the relationship between them. To this end, the views of practitioners in manufacturing, third party logistics and retail have been solicited through a series of focussed interviews based on the template of Lummus et al. (2001). As well as providing some insights into RQ1, these views form the basis of the proposed model which illustrates the relationship between SCM and logistics in practice. Furthermore, the approach of all respondents is broadly in line with the *Four Fundamentals*, thus enhancing the author's confidence in this construct as a "unified definition of SCM" and a rational basis for exploring in more detail the research questions set out in Chapter 2.

There is a growing recognition that firms cannot achieve their true competitive potential by operating in isolation. The philosophy of SCM is firmly based on recognising that it is only by working in a more integrated manner that competitive advantage can be maximised. However, for this to become a reality the development of common definitions and understandings between supply chain partners is a critical success factor. The corollary of this is that a lack of definitional consistency and a common understanding is an inhibitor to the successful adoption of SCM thinking in practice. The model proposed in this chapter addresses this issue with specific reference to the relationship between SCM and logistics. In this way, a stronger basis is created to



facilitate the collaborative approaches necessary for the improvement of overall supply chain capability and performance.

Chapter 5 describes the second phase, and the second qualitative component of the author's overall research design, i.e. the focus groups.

## CHAPTER 5

### PHASE II: FOCUS GROUPS

#### 5.1 Background

As noted in Chapter 3, the use of the focus group method has been identified as an element within the overall research design adopted in this research.

The chapter structure is based on a variation of the generic process proposed by Sanchez Rodrigues et al. (2010) and shown in Figure 5.1 (below). This follows on from Figure 3.6 in Chapter 3.

In relation to the top part of Figure 5.1 (“Research Design and Strategy”), the research problem and associated research questions have been set out in Chapter 2, based on the author’s literature review. The research philosophy (multi-paradigmatic) and research methodology (based on methodological pluralism) to be adopted in answering these questions are described in Chapter 3, as are the specific techniques and methods to be used as part of the evolving research design. In particular, Chapter 3 addressed issues related to: detailed focus group design (sections 3.7.2 to 3.7.4); conducting the focus group (section 3.7.5); and, analysing the data (section 3.7.6). The focus group method will be used as part of inductively answering RQ1 and RQ3. This chapter focuses on how the method has been used as part of answering RQ1, i.e. What is the current level of understanding of SCM in practice? However, the groups were designed and conducted to facilitate the emergence of issues that relate to the other three RQs.

Following this introduction, section 5.2 summarises the main findings from the focus group sessions. Feedback was elicited from participants based on a summary of these findings – this is outlined in section 5.3. The discussion in section 5.4 reflects on the planning, execution and analysis of the focus group research based on the four criteria for qualitative research proposed by Lincoln and Guba (1985) and goes on to explain how the findings from the focus groups: (i) were used in answering RQ1; and, (ii) informed further refinement of the *Four Fundamentals* construct. Finally, some concluding comments are posited in section 5.5.

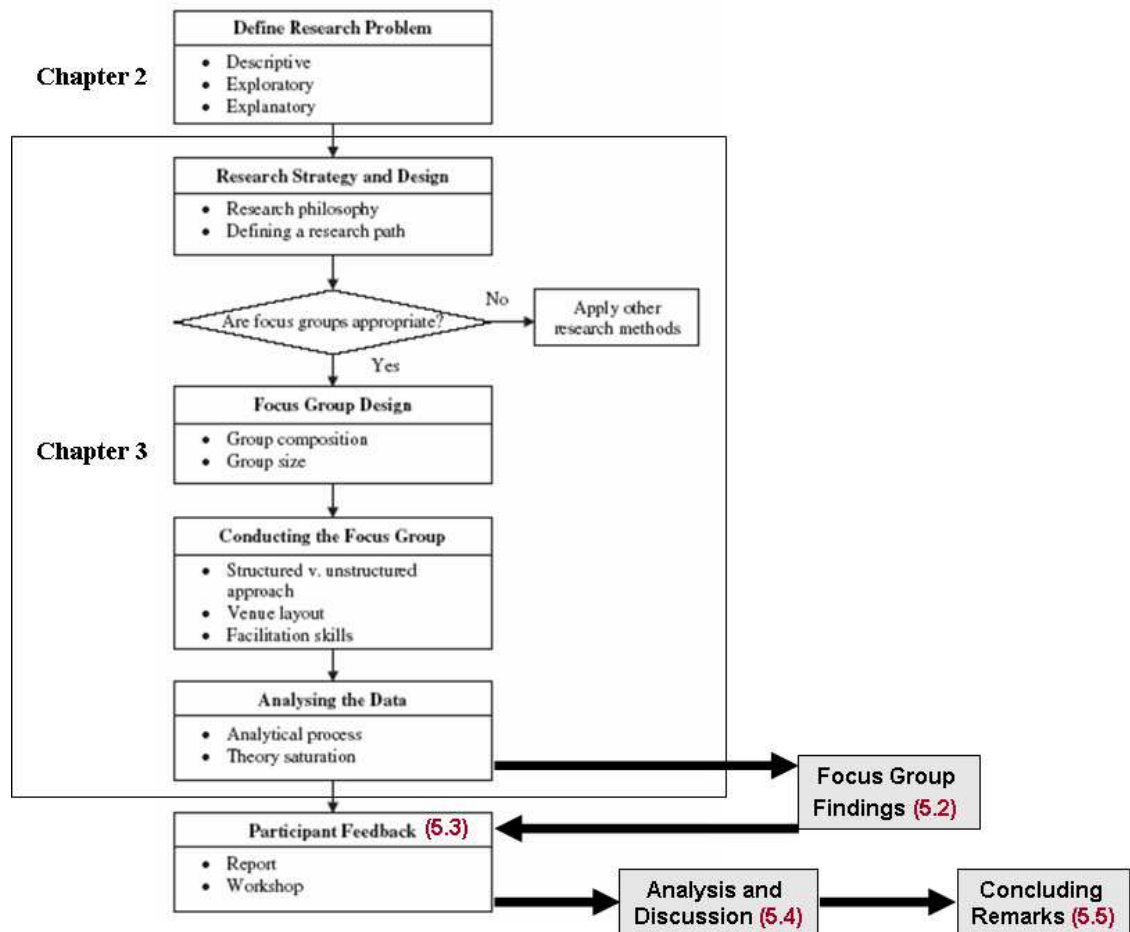


Figure 5.1: Structure of Chapter 5  
Based on Sanchez Rodrigues et al. (2010)

## 5.2 Focus Group Findings

The focus group sessions were carried out in April, October and November 2010. Appendix 8 contains information about the structure of each of the groups in terms of job responsibilities, sectors (including a short profile of each participating company), nationality and gender. The main issues that arose in each focus group session, as they relate to each of the *Four Fundamentals*, are discussed in the subsequent sections. In each case, the summaries are based on:

- Recordings of the sessions;
- Extensive notes taken by the author during the sessions (where he acted as an observer);
- Points captured on flip charts by the facilitator; and,
- A short report prepared by the facilitator following each session.

The analytical approach adopted by the author is based on the points made in section 3.7.6 and mirrored that used in the focussed interviews in phase I of the empirical

research (see section 4.3). This combination of elements of content analysis and grounded analysis allowed the data to be interrogated with reference to constructs and ideas that have been decided in advance (i.e. content analysis), as well as letting the data “speak for itself” thus guiding the researcher towards an understanding of the data (i.e. grounded analysis). This guides the presentation of the findings in the following sections. For all focus group discussions, the key words and phrases used by participants are related back to each of the author’s *Four Fundamentals*, and a number of other issues raised that are not specifically linked to the construct are highlighted.

### **5.2.1 Focus Group 1 (FG1)**

The key words and phrases used by participants to articulate the main issues that emerged during the FG1 discussions are outlined in Figure 5.2 (below). Two issues emerged that were not explicitly referred to in the author’s construct: sustainability and continuous improvement. They are highlighted in Figure 5.2 in red and are discussed in their appropriate *Fundamentals* section.

#### **Fundamental One – Objectives**

The idea that a supply chain needed to be *adaptable* was seen by many participants as an important issue. Much discussion took place in relation to concepts such as flexibility and agility, particularly in the context of the recent volatility in many markets. There was a general consensus that, as one participant put it “it’s not good enough for things to work today, in today’s market conditions – it must work equally well in different market conditions”. Several participants highlighted to role the SCM needs to play in achieving *minimum cost* and *enhanced service quality*. Closely related to the former, the notion of using SCM to improve operational *efficiency* was also highlighted by participants; in the context of the latter the need for *timeliness*, and in particular for reduced cycle times and improved delivery reliability, emerged as common themes. Two sub-groups specifically alluded to the concept of *value*. However, there appeared to be a lack of clarity and agreement on what the concept is about. Finally, one word which was used by most sub-groups was *optimisation*. Again, there was general agreement that SCM was ultimately about optimising firm financial performance but a lack a clarity and agreement on what aspects of performance SCM is primarily aimed at improving.

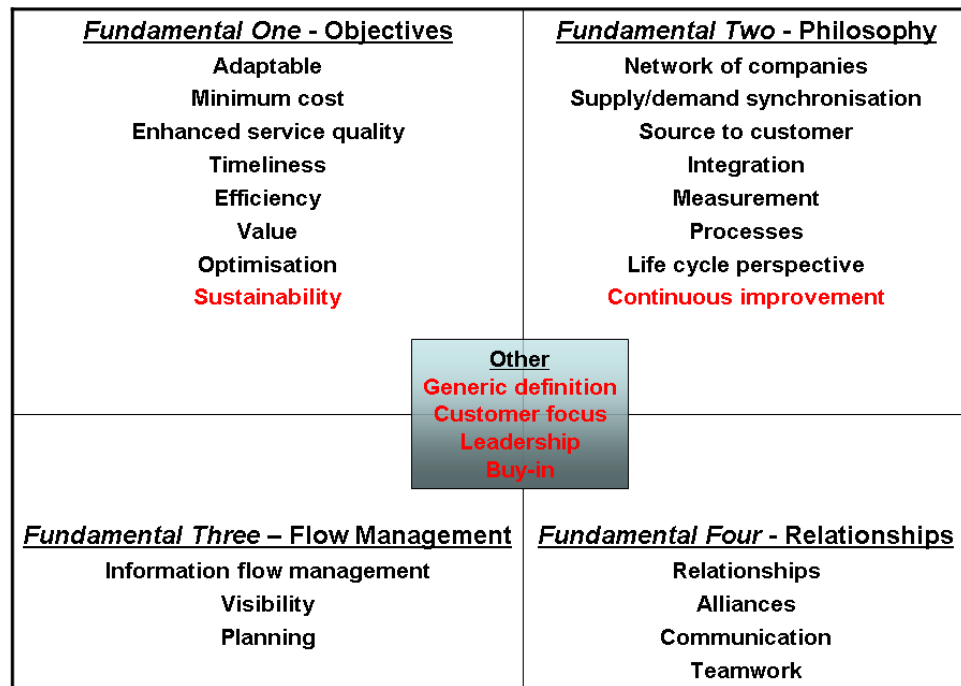


Figure 5.2: Summary of Feedback from Focus Group 1

One issue that emerged as a possibly important SCM objective was *sustainability*, particularly from an environmental perspective. The participants from the two large logistics service providers (i.e. 3PL1 and 3PL2) were to the fore in highlighting this issue.

#### Fundamental Two – Philosophy

In answering the question “What do you understand by the phrase *supply chain management*?” one sub-group initially responded by stating that, “SCM is, of course, about the management of the supply chain!” This apparently trite and trivial response was then elaborated by setting out what the group understood by the phrase “supply chain”. In this context, the concept of a *network of companies* was introduced. The need for this network to operate in a way that ensures *supply/demand synchronisation* was highlighted. Several participants elaborated on the network concept by providing a broad description of the supply chains of which their organisations are part using the *source to customer* model (or the “from the farm to the fork” food industry variant) and highlighting the need for better *integration* of inter-firm business *processes*. Furthermore, the effective *measurement* of performance was regarded as a key enabler in this regard. A couple of other specific issues were raised. The need for a *life cycle perspective* was introduced by the participant from pharmaceutical manufacturer MAN2. His point was that SCM issues should be considered from initial product

concept through product development and introduction through to the end of a product's life cycle. Interestingly, this participant's background was largely in the product design/new product introduction area but his point found general agreement amongst participants.

The other issue that emerged as a possibly important aspect of SCM philosophy was that of *continuous improvement*. This built on the statement made by one participant that: "it's not good enough for things to work today, in today's market conditions – it must work equally well in different market conditions". There was general agreement that the culture of continuous improvement (or kaizen) is an important dimension if the performance of a supply chain is to be sustained over a period of time.

#### Fundamental Three – Flow Management

All participants agreed that *information flow management* was a central issue in SCM, with several providing an overview of the ICT systems in use in their organisations. This led to a discussion about the importance of inventory *visibility* as a prerequisite for effective inventory management. Several participants explained their roles in the *planning* of supply chain processes. As aptly put by one participant, "supply chains don't plan themselves – the planner needs to be pro-active in this regard".

No other issues specifically relevant to *Fundamental Three* that are not explicitly captured by the construct were raised by participants.

#### Fundamental Four – Relationships

There was general consensus that *relationships* (internal and external), and their management, are critical in SCM. The word "*alliances*" was used by several participants in this context. There was also general agreement that SCM is about *communication* (again, internal and external) with a number of participants relating interesting stories to illustrate the consequences of weaknesses in this regard. There was unanimity that better *teamwork* was the key to achieving improvements in this area.

No other issues specifically relevant to *Fundamental Four* that are not explicitly captured by the construct were raised by participants.

### Other Issues

Following a presentation of the *Four Fundamentals*, participants were then asked to consider and comment on the validity of the construct in general terms, as well as on its specific applicability in their own sectors. A number of points emerged.

**Generic definition.** It was widely agreed that the development of a generic definition (i.e. one that is relevant in every detail to every firm in every sector) is a difficult task. The reality is that different drivers and strategic imperatives exist in every firm. Nonetheless, all participants agreed that all components of the construct were relevant to a greater or lesser extent in their organisations. However, there was a widely held view that the basic construct would need to be adapted somewhat in each individual company and sector to reflect specific concerns. For example:

- the public sector participant (PS1) felt that the language used would need to be modified somewhat to reflect the not-for-profit nature of a public sector body;
- the participant from SW1 specifically introduced the idea of supply chain for *products/services*, i.e. those that supply offerings to the marketplace that are a mix of physical product and services or, as is often the case with software, mixed physical/digital products;
- the pharmaceutical industry participant (MAN2) was strongly of the view that for any definitional construct to be meaningful in his sector it would need to reflect the highly regulated nature of the pharmaceutical industry; and,
- several participants felt that the construct in general, and *Fundamental Four* in particular, needs to emphasise more clearly the role of relative firm power and its role in determining supply chain dynamics.

**Customer focus.** Despite the fact that the concept of customer service “setting the spec” is a major element of *Fundamental One*, there was a widely held view among participants that the concept needs to further emphasise the importance of customer focus. This issue prompted an interesting discussion and debate on the use of the word “supply” in the phrase “SCM”. Several participants felt that this implies a focus on the buy side of the supply chain and an attendant supply-driven “push” orientation, i.e. rather than a demand-focused “pull” orientation.

**Leadership.** A view also emerged during the discussion that the construct fails to emphasise the role of leadership in making supply chain change and improvement

happen. Interestingly, this view was most strongly held by those more experienced participants who hold relatively senior leadership roles within their organisations (notably MAN3 and 3PL2). It was felt that the definition was somewhat passive in the sense that for demonstrable supply chain change to be implemented in practice there needs to be a clear, leadership-driven, vision and strategy for change.

**Buy-in.** There was also a perspective expressed that, in addition to leadership and senior management commitment, the construct needed to stress the importance of employee involvement and “buy-in” in the supply chain change and improvement process. Several participants indicated their frustration at change being imposed in a top-down manner by senior management without proper consultation and employee involvement. Interestingly, this view was most strongly held by those less experienced participants who hold relatively junior management or supervisory roles within their organisations (notably MAN2 and PS1). This perspective also appeared to be more strongly held by those from larger organisations.

### 5.2.2 Focus Group 2 (FG2)

The key words and phrases used by participants to articulate the main issues that emerged during the FG2 discussions are outlined in Figure 5.3. Again, two other issues not explicitly referred to in the *Four Fundamentals* emerged – stakeholders and acquisition of supply chains – and are discussed where appropriate.

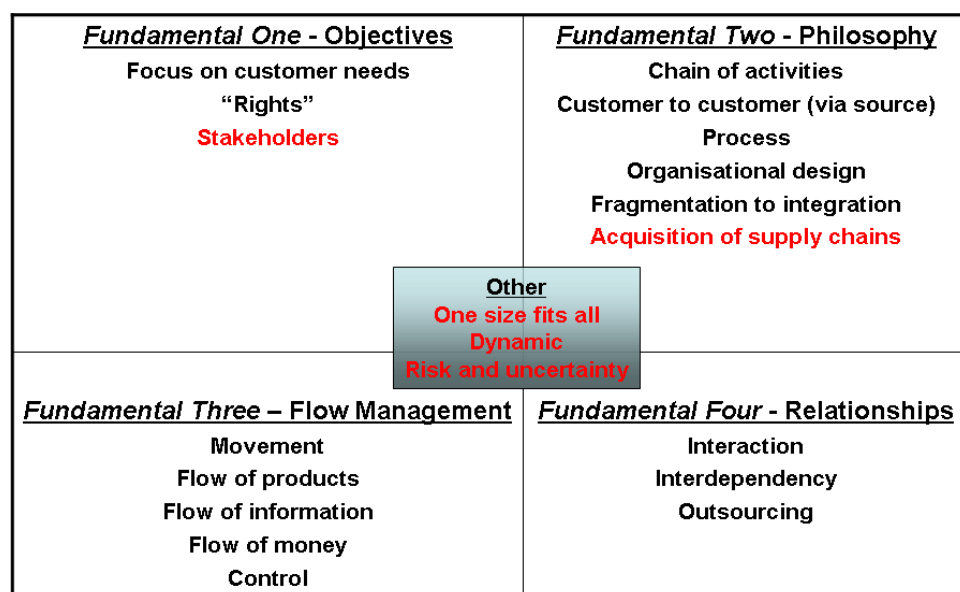


Figure 5.3: Summary of Feedback from Focus Group 2



### Fundamental One – Objectives

There was general agreement among participants that the key to establishing robust supply chain objectives was the need for a strong *focus on customer needs* throughout the supply chain. Several participants referred to the “seven rights” of logistics/SCM or a variation on this theme. This construct (see, for example, Lambert and Stock (1992)) states that the role of logistics/SCM is to ensure the availability of the right product at the right time in the right quantity in the right condition at the right place for the right customer at the right cost. Several participants felt that the “seven rights” provided a good working definition of SCM. However, as the discussion progressed a general consensus emerged that, whilst it might provide a checklist of the main objectives of SCM, the “seven rights” does not represent a complete definition of SCM itself. A number of participants felt that the “seven rights” relate more to logistics specifically rather than the wider SCM domain.

One issue not explicitly referred to in the author’s construct that emerged as a possibly important issue in this context was that of identification of *stakeholders*. One of the public sector participants (PS3) felt that wider business objectives, as well as more specific SCM objectives, must be formulated with specific reference to an organisation’s main stakeholders. In the case of a public sector organisation such as PS3 this raises a number of questions, most notably “who is the customer?” The customer could be the end-user of the service, the Government, members of the public (i.e. “taxpayers”) or some other stakeholder(s). Each has its own specific aspirations and they are often incompatible with those of other stakeholders. In any case, a challenge for public sector organisations relates to: (i) identification of the key customer/stakeholder groups; and (ii) formulation of objectives that relate to the aspirations of these groups. The other public sector participant (PS2) identified with this challenge and presented some examples to illustrate this point. In a similar vein, the PS3 participant noted that in a highly regulated industry such as hers, the regulatory bodies are key stakeholders and the formulation of objectives should reflect their pivotal role. This point was reinforced by the MAN6 participant, also from a sector that is highly regulated (i.e. life sciences).

### Fundamental Two – Philosophy

Participants generally concurred that a supply chain is a *chain of activities*. These activities start and end with the customer (i.e. *customer to customer*). Thus, SCM starts with the identification of a customer requirement and ends when that requirement has

been satisfied. A number of participants were more comfortable with the “source to customer” model of the supply chain. The discussion converged towards the view that sourcing of material and service inputs is one of the important activities in the chain – hence the *customer to customer (via source)* concept. Several participants suggested that SCM is a *process*, i.e. a group of interconnected and inter-related activities. In this context, there are issues that need to be addressed in relation to *organisation design* and structure. The focus here needs to be on replacing traditionally fragmented organisational structures with configurations that are characterised more by integration (*fragmentation to integration*).

The food manufacturing participant (MAN7) noted that part of the strategy of his parent company involved the *acquisition of successful supply chains* in sectors in which it wanted to develop a presence. This reinforces the key element of *Fundamental Two* that “supply chains, not companies, compete”. His own organisation was the subject of such an acquisition in 2001.

#### *Fundamental Three – Flow Management*

Participants generally agreed that managing the *movement* of resources throughout the supply chain was a key SCM activity. This is not just about the physical movement and transportation of products but also relates to the management of the *flow (of products, information and money)*. The discussion also resulted in the general consensus that management of the key flows provides the basis for effective supply chain *control*. As one participant succinctly put it: “if you want to control anything you must have visibility – management of the information flows is central to this”.

No other issues specifically relevant to *Fundamental Three* that are not explicitly captured by the construct were raised by participants.

#### *Fundamental Four – Relationships*

The concept that overall supply chain performance is dependent on the nature of the *interaction* between supply chain activities was acknowledged by most participants. This recognises the *interdependency* that exists between the various activities. It was further recognised that this interdependency extends beyond the internal activities within a firm into activities and processes that span organisational boundaries. The use

of *outsourcing* as an element of strategy by organisations in recent years has made this issue more important.

No other issues specifically relevant to *Fundamental Four* that are not explicitly captured by the construct were raised by participants.

#### Other Issues

Following a presentation of the *Four Fundamentals*, participants were then asked to consider and comment on the validity of the construct in general terms, as well as on its specific applicability in their own sectors. A number of points emerged.

**One size fits all.** There was general agreement among participants that it is very difficult to develop a generic definition of SCM. One participant raised the question: “does one size fit all firms in terms of defining SCM?” The general consensus was that, while the overall thrust would not differ hugely between firms from different sectors, the detailed issues that needed to be addressed would vary considerably. Several participants introduced sector-specific, or even firm-specific, issues to illustrate such differences. For example, the public sector representatives suggested that while the cost/customer service approach articulated in *Fundamental One* was robust, there is a need to broaden the scope of the objectives to reflect their particular strategic drivers (see above). The focus group also suggested that it was difficult to develop a definitional construct that has validity for product, service and digital supply chains. For example, the participant from 3PL6 felt that the language used in the construct was heavily product-oriented thus reflecting much of the published work and examples of good SCM practice. She felt that the language would, therefore, need to be adapted by providers of service products (i.e. as opposed to physical products) to reflect the nature of their businesses. The SW2 participant made a similar point in relation to digital products (i.e. software in this case).

Of particular note was the discussion that took place specifically in relation to the food supply chain<sup>35</sup>. The discussion suggested that firms from different parts of the supply chain have different emphases in terms of their understandings of SCM and that this might make it more difficult to achieve higher levels of integration between them.

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<sup>35</sup> MAN7: processing and distribution; 3PL7: distribution; 3PL8: distribution to retail partners; 3PL9: distribution, wholesale and retail.

**Dynamic.** The 3PL9 participant raised the need for supply chains be dynamic, by which she meant highly responsive to the changing business environment and to changes in customer requirements. Some participants felt that this need for dynamism was implicit in the *Four Fundamentals* (in particular in *Fundamental One* with its emphasis on customer service). A consensus emerged that dynamism in this context was more an issue of good supply chain practice rather than something that needed to be explicitly captured in a definitional construct.

**Risk and uncertainty.** A lengthy discussion took place in relation to the inherent uncertainty in the business environment and the need to manage the attendant risk factors in the supply chain. Several participants raised the related issue of resilience in a supply chain context. The general consensus was that the economic volatility and turbulence of recent years had resulted in new challenges for supply chain professionals in the execution of their day-to-day responsibilities. The downturn had also resulted in the downsizing of many of the participants' firms; this in turn resulted in many participants fearing for their own futures (a fear compounded by the fact that the MAN6 participant was about to lose her job as a result of that firm closing its Irish manufacturing operations). In any case, the overall view was that these pressures, while very real and current for participants, did not impact directly on how SCM should be defined.

### **5.2.3 Focus Group 3 (FG3)**

The key words and phrases used by participants to articulate the main issues during the FG3 discussions are outlined in Figure 5.4 (below). Continuous improvement again emerged as did sales and operations planning (S&OP).

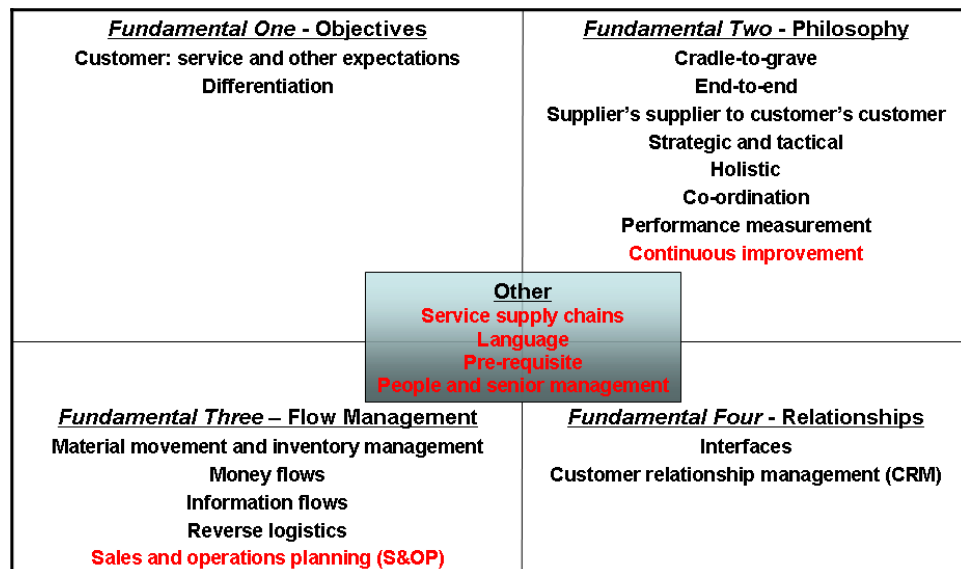


Figure 5.4: Summary of Feedback from Focus Group 3

#### Fundamental One – Objectives

All participants agreed that it was the *customer*, in terms of *service and other expectations*, that drives the supply chain. Of particular interest in this context was the fact that all participants agreed with the statement that “it is the customer that should drive the supply chain” while a minority stated that this actually happened in practice. The MAN8 participant explained how excellence in customer service was a source of strategic *differentiation* in his business. He explained that quality (in terms of product specification, functionality and performance) was a given (i.e. an order qualifier) and the price was under serious downward pressure in an increasingly competitive marketplace. Other participants could, to a greater or lesser extent, provide similar examples from their organisations.

No other issues specifically relevant to *Fundamental One* that are not explicitly captured by the construct were raised by participants.

#### Fundamental Two – Philosophy

The need for a life cycle (or *cradle-to-grave*) perspective was subscribed to by the four participants from manufacturing organisations. The point is that SCM needs to be a consideration from initial product concept through to product development and introduction and through to the end of a product's life cycle. A MAN8 example in relation to postponement illustrated this point – i.e. products have to be designed to enable a postponement or late configuration strategy to be adopted. All participants

agreed that SCM was *end-to-end* (i.e. from the *supplier's supplier* to the *customer's customer*). The MAN9 participant introduced a specific distinction between *strategic* and *tactical* SCM. Her strongly held view was that her role was a tactical one which was primarily concerned with execution. Execution in this context refers to execution of a supply chain strategy into the development of which she felt she made little input. All participants expressed a degree of frustration with their lack of involvement in the more strategic dimension of the subject. The participant holding the most senior position (from MAN6), and the only participant with a genuine end-to-end supply chain responsibility, asserted that SCM is first and foremost a strategic issue. He further stated that if not treated as such – i.e. if the focus is mainly tactical or operational – then this inevitably results in “fire-fighting” and crisis management throughout the supply chain. These sentiments found strong resonance among all other participants. The group’s conclusion was that SCM needs to be proactive with a concern for building supply chain capability in advance of the requirement (i.e. rather than being primarily about reacting to periodic crises). In line with this, participants were strongly of the view that a more *holistic* approach was needed if proper *co-ordination* of internal supply chain processes was to be achieved. There was also a widely held view that a robust *performance measurement* system, based on an agreed set of key performance indicators (KPIs), was the key to achieving continuous improvement. There was a lengthy discussion about the nature of KPIs used in participants’ supply chains. The general consensus was that determining an appropriate set of KPIs is very dependent on the specific nature of a firm’s markets, customers and cost drivers, as well as on other strategic imperatives. Nonetheless, there was a widely held view that inappropriate performance measurement can accentuate fragmentation between supply chain processes (both internally and externally). The MAN8 participant illustrated this point with his experience of negotiating with suppliers with a view to securing lower unit prices – a process driven by the KPIs imposed on the purchasing function. The direct consequence of this was lower unit prices, achieved by purchasing in bulk, but higher costs elsewhere in the supply chain (particularly in terms of inventory holding costs).

One issue not explicitly referred to in the author’s construct that emerged as a possibly important aspect of SCM philosophy was that of *continuous improvement*. As noted previously, there was a widely held view that a robust performance measurement system, based on an agreed set of key performance indicators (KPIs), was the key to this.

### Fundamental Three – Flow Management

All participants recognised the importance of the management of *material movement* through the supply chain as a key element of SCM. They further recognised the importance of the related issue of *inventory management*. The 3PL10 participant expressly referred to inventory management as a “microcosm” of the wider SCM domain, with its focus on balancing cost and service objectives. Participants also broadly agreed that, in addition to materials and inventory management, the management of *money flows* and *information flows* were important. The MAN10 participant introduced the concept of managing the reverse flow of materials (i.e. from customer back to supplier) and *reverse logistics* and it was generally agreed that this was an aspect of SCM that was likely to grow in importance in the future in the light of legislative developments and increased environmental awareness.

One issue not explicitly referred to in the author’s construct that emerged as a possibly important aspect of *Fundamental Three* was that of *sales and operations planning (S&OP)*. The focus group later concluded that, whilst this terminology was not explicitly used in the *Four Fundamentals*, S&OP was implicitly captured in the construct. The point is that supply chains have to properly planned with a strong focus on synchronising supply and demand and that this can only be achieved by planning sales and operational processes in an integrated way. These points are probably most closely associated with *Fundamental Three* but also find expression elsewhere in the author’s construct.

### Fundamental Four – Relationships

Participants recognised that *interfaces* between supply chain processes (both internal and external) have to be properly planned and executed. The specific case of *customer relationship management (CRM)* was raised by several participants as an illustration of how this applies in the specific case of managing the interface with key external customers.

No other issues specifically relevant to *Fundamental Four* that are not explicitly captured by the construct were raised by participants.

### Other Issues

Following a presentation of the *Four Fundamentals*, participants were then asked to consider and comment on the validity of the construct in general terms, as well as on its specific applicability in their own sectors. A number of points emerged.

**Service supply chains.** The participants from the 3PL sector and PS1 expressed concern that the construct was heavily based on product supply chains. It was felt that the detail would need to be modified for the construct to find more resonance in service-oriented organisations.

**Language.** Following on directly from this issue, the participants from the 3PL sector and PS1 expressed concern that the construct made extensive use of language and terminology associated with manufacturing industry. It was felt that the language and terminology would need to be re-visited if the construct is to find more resonance in non-manufacturing organisations. The four participants from manufacturing organisations made the point that language and terminology tends to be sector-specific and that therein lay the crux of this challenge.

**Pre-requisite.** The MAN9 participant raised the specific question as to whether high levels of internal integration were a pre-requisite for external integration. There was general agreement – at least on a conceptual level – that this was the case. However, participants struggled to illustrate this opinion with concrete practical examples.

**People and senior management.** The MAN8 participant was of the view that “supply chains are really about people” and that this does not come out clearly enough in the *Four Fundamentals*. He noted that customers are people, suppliers are people, and that supply chains are directed, planned and executed by people. He further stated that unless there was serious senior management buy-in to the need for change in supply chains that such change could never happen. Much of the discussion around this point reverted to issues concerning the difference between strategic and tactical SCM (see above). Nonetheless, there was broad agreement that the people dimension should be at the core of any worthwhile definition of SCM.



### **5.3 Participant Feedback**

Krueger (1998) suggests that focus group process should culminate in the writing of a final report and dissemination of feedback to participants. However, the logistics papers reviewed by Sanchez Rodrigues et al. (2010) and summarized in Appendix 8 to this Chapter provided no information on this feedback process.

Summaries of each of the focus groups, using a similar format to those set out in section 5.2 (above) were distributed to group participants for comment. Some participants reverted to the author in relation to relatively minor points of detail. This process ensured that the summaries were an accurate representation of the discussion sessions, thus enhancing the credibility of this element of the research. As noted in Chapter 4, credibility is analogous to internal validity in quantitative research, with Collis and Hussey (2009, p. 65) defining validity as “the extent to which the research findings accurately reflect the phenomena under study”.

### **5.4 Analysis and Discussion**

This section focuses on three specific issues. Firstly (in section 5.4.1), the author reflects on the planning, execution and analysis of the focus group research based on the four criteria for qualitative research proposed by Lincoln and Guba (1985). This includes an explanation of how testing for data saturation was carried out. It also results in a number of limitations of the focus group method being identified and attendant suggestions for further work being proposed. Section 5.4.1 adopts a similar approach to that of section 4.4.8 in relation to focussed interviews. Section 5.4.2 goes on to explore how the findings from the focus group research can be used to answer RQ1, i.e. “What is the current level of understanding of SCM in practice?” Section 5.4.3 explains how the focus group data has been used to refine the *Four Fundamentals* construct – this is analogous to section 4.4.6 in relation to focussed interviews and uses the concept of theoretical saturation as its basis.

#### ***5.4.1 Qualitative Criteria: Reflection and Evaluation***

As noted in relation to the focussed interviews described in Chapter 4, if the shortcomings of any qualitative research method are to be mitigated then their efficacy should be assessed using well established evaluation criteria. As also noted in Chapter

4, Lincoln and Guba (1985) recommended four criteria: credibility, transferability, dependability and confirmability. However, the focus group research carried out to date in the logistics/SCM domain has been largely characterized by a lack of awareness of such qualitative criteria and, while transferability and confirmability issues are addressed in much of the logistics/SCM focus group work, there is evidence of limited consideration of credibility and dependability issues (Sanchez Rodrigues et al., 2010). Sanchez Rodrigues et al. (2010) suggest a number of practical approaches that can be adopted to enhance the validity and reliability of focus group research in logistics/SCM. The following sections indicate how the author used these and other approaches in the planning, execution and analysis of his focus groups.

### Credibility

Sanchez Rodrigues et al. (2010, p. 89) suggest that credibility can be enhanced “by testing for theory saturation and inviting participants to comment on summaries of the research findings”.

**Data saturation.** There is a lack of guidance in the literature in relation to how data saturation testing can be rigorously carried out. Figure 5.5 (below) summarises how the author approached the task. Parts (a), (b) and (c) of this table reproduce the key words and phrases used by participants to articulate the main issues that emerged during the three focus groups sessions (i.e. Figures 5.2, 5.3 and 5.4 respectively). As shown in part (d), a total of 27, 20 and 21 key words or phrases were captured for FG1, FG2 and FG3 respectively. In the case of FG1, for example, this comprised 23 key words or phrases from the initial part of the focus group discussion (i.e. in response to the facilitator’s question “What do you understand by the phrase *supply chain management*?”). Of these, two were concepts (i.e. *sustainability* and *continuous improvement*) not explicitly captured by the *Four Fundamentals* construct. For FG1, a further four key words or phrases captured the group’s considerations and comments in relation to the validity of the construct in general terms, as well as on its specific applicability in participants’ own sectors. Thus, for FG1,  $23 (2) + 4 = 27$ . Similarly: for FG2,  $17 (2) + 3 = 20$ ; and, for FG3,  $17 (2) + 4 = 21$ . Most importantly from a data saturation perspective, part (e) of Figure 5.5 shows the new words and phrases that emerged during FG2 and FG3. For FG2, there are eight new words or phrases; for FG3, there are five. Figure 5.6 shows the number of new words or phrases introduced across the three sessions for each of the *Fundamentals* and in relation to other issues.

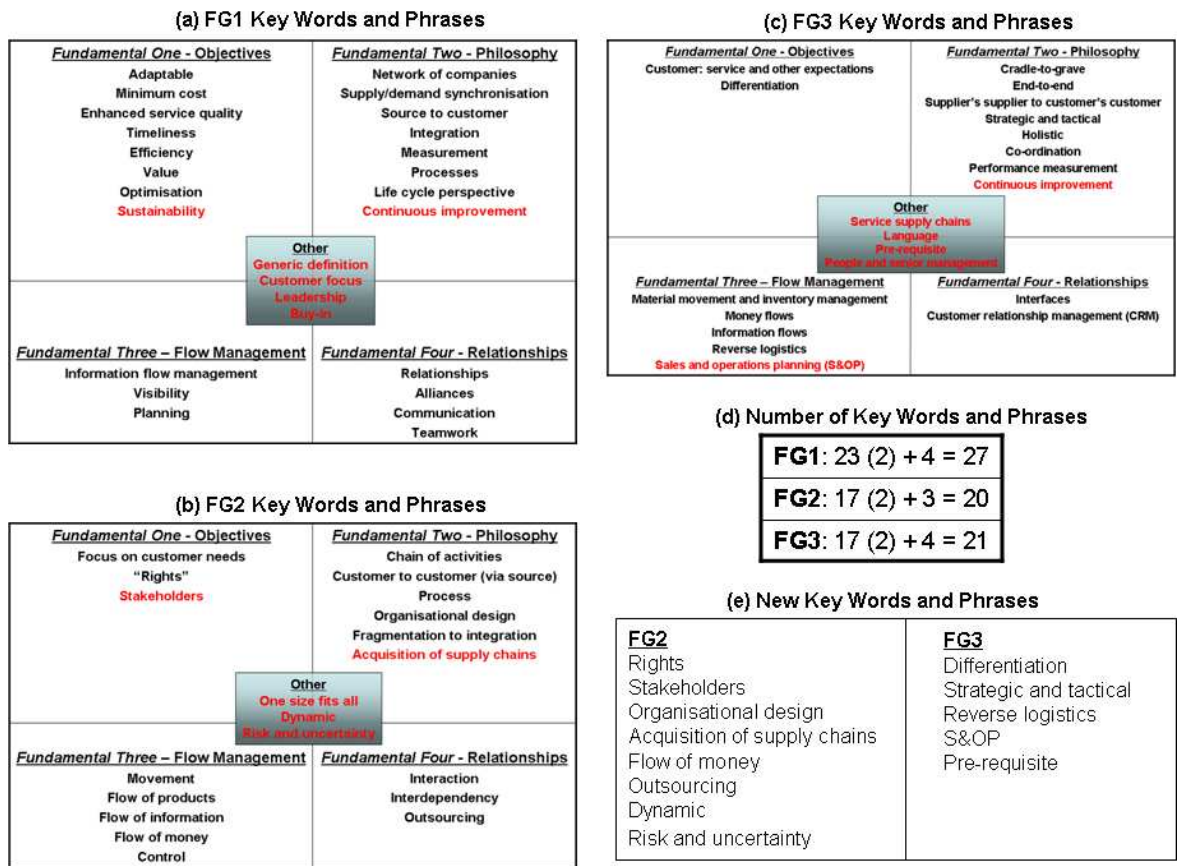


Figure 5.5: Testing for Data Saturation

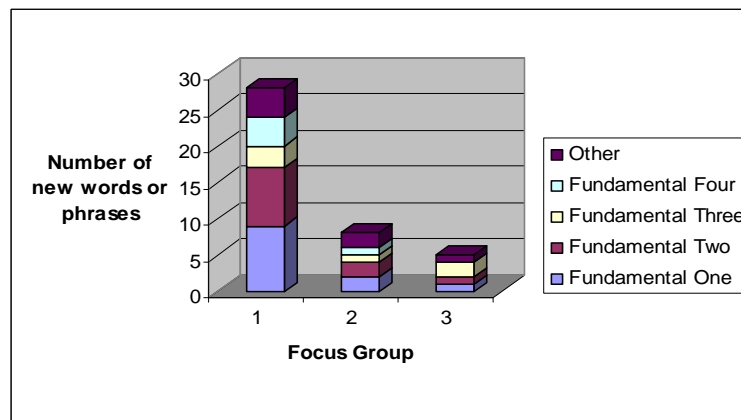


Figure 5.6: New Words or Phrases in Focus Group Sessions

Examining the five new words or phrases from FG3 led the author to conclude that data saturation had been reached. Of these five, the first (i.e. *differentiation*) relates to the concept of customer service as a source of strategic differentiation. Whilst this concept was not explicitly set out in FG1 or FG2, the author and the facilitator felt that it had been implicit in discussions, particularly in relation to *value* in FG1 and the need for a *focus on customer needs* in FG2. A similar situation was evident in relation to the second key phrase, i.e. *strategic and tactical*. FG1 and FG2 tended to focus on more strategic aspects of SCM during their sessions. However, the focus on *planning* in FG1,

and on *control* in FG2, were primarily concerned with the tactical rather than the strategic dimension of SCM. The third new concept introduced by FG3 was that of *reverse logistics*. Whilst this particular terminology was not used by FG1 and FG2 participants, the underlying concept was implicit in their deliberations. This was particularly the case in the FG1 discussion of the *life cycle perspective* and in the FG2 discussion on *movement* and *flow*. The fourth new phrase, i.e. *sales and operations planning*, was just that – a new phrase. The underpinning concepts had already emerged during the earlier focus group sessions. This was particularly the case in the FG1 discussion of *supply/demand synchronisation* and the FG2 discussion in relation to *flow* management and *control*. Finally, the notion that internal integration is a *pre-requisite* for external integration raised by FG3 had not been in any way alluded to by FG1 or FG2. However, as noted in section 5.2.3, this was a question raised by one participant during the discussion. As further noted in section 5.2.3, whilst there was general agreement on a conceptual level about this point, participants struggled to illustrate this opinion with concrete practical examples.

Based on his work in this area, the author takes issue with Sanchez Rodrigues et al. (2010). Their paper fails to make a clear distinction between data saturation and theoretical saturation. They use the phrase “theory saturation” throughout their paper when referring primarily to data saturation. Whilst, as noted by Bryman and Bell (2003), they are similar concepts they address quite different issues. The discussion above refers only to data saturation and the approach adopted by the author in concluding that three focus group sessions were sufficient in the current research. As noted earlier, theoretical saturation occurs when the researcher can assume that her/his emergent theory is adequately developed to fit any future data collected. This concept is much more pertinent to the author’s attempt to refine the *Four Fundamentals* construct – see section 5.4.3.

**Participant feedback.** In addition to testing for data saturation, as noted in section 5.3 participant feedback was invited and this has been incorporated as appropriate into the discussion summaries set out in section 5.2 (above). In any case, qualitative data such as that generated by the author using the focus group method is often highly credible in comparison with quantitative data generated using, for example, large scale surveys.

### Transferability

The relatively small sample consulted during the focus group sessions (i.e. 28 individuals in total) is not intended to be definitive and transferability (or generalization) is, therefore, difficult. Nonetheless, Sanchez Rodrigues et al. (2010) suggest that transferability can be enhanced by: (i) ensuring that diverse groups of specialists take part; and, (ii) relating the findings back to the literature. As noted in section 5.2 (above) participants come from a range of different industry sectors and backgrounds, as well as being diverse from a nationality and gender perspective. Given that the focus group method was used to a large extent by the author to refine the *Four Fundamentals* construct, the process did explicitly make continuous reference back to the literature. In other words, the *Four Fundamentals* were inductively derived from the literature and each focus groups session made direct reference back to this construct.

### Dependability

In relation to dependability, Sanchez Rodrigues et al. (2010, p. 89) note that “here it was critical that the researchers fully document the whole focus group process, from design through to analysis and feedback”. In this regard, the author fully documented the whole focus group process, from design through to analysis and feedback – indeed, this documentation forms the basis of this chapter.

### Confirmability

Finally, confirmability – the degree to which the results could be confirmed or corroborated by others – can be achieved by using the focus group method as part of a wider triangulated research design, as is the case in the current research. The research described in this chapter is part of a larger project that is based on methodological triangulation, i.e. the focus groups represent just one aspect of a wider research design. The combined inductive/deductive approach involves the integrated use of:

- focussed interviews in phase I (as described in Chapter 4); and,
- a questionnaire survey in phase III (aimed primarily at answering RQ2 and deductively testing the refined *Four Fundamentals* construct – see Chapter 6).

#### **5.4.2 Using Focus Group Data to Answer RQ1**

RQ1 asked: “What is the current level of understanding of SCM in practice?”. Participants were chosen from a range of different industry sectors and backgrounds, as well as being diverse from a nationality and gender perspective, to enhance

transferability of the findings. Nonetheless and as noted previously, the relatively small sample consulted during the focus group sessions (i.e. 28 individuals in total) means that providing a definitive response to this question is difficult. Notwithstanding this caveat, the author has conducted an analysis of the data collected during the focus group sessions with a view to providing fresh insights into this question. The following paragraphs describe this analysis.

Figure 5.7 (below) shows an overview of the *Four Fundamentals* construct. This is based on Table 3.5 (above), which in turn is based on the indicated sections and sub-sections in Chapter 2 (from section 2.8 through to section 2.11). For each *Fundamental*, Table 3.5 contains an introductory section and one entitled “Summary and Some Concluding Points”. For the purposes of this analysis these sections have been omitted. The focus is, therefore, on the substantive constituent elements of each of the *Fundamentals*. In this way, thirteen key concepts (three for each of *Fundamentals One, Two* and *Three*; four for *Fundamental Four*) are used to describe the essence of the construct, with the core of the presentation made by the author during the focus group sessions being based on these concepts.

<p><b><u>Fundamental One – Objectives</u></b></p> <p>Customer Service Total Supply Chain Investment and Costs The Service/Cost Conundrum</p>	<p><b><u>Fundamental Two – Philosophy</u></b></p> <p>Internal Chain Integration External Chain Integration Performance Measurement</p>
<p><b><u>Fundamental Three – Flow Management</u></b></p> <p>Managing Material Flows Managing Money Flows Managing Information Flows</p>	<p><b><u>Fundamental Four – Relationships</u></b></p> <p>Types of Relationships The Impact of Vertical Disintegration Strategic Partnering The People Dimension</p>

Figure 5.7: Overview of the *Four Fundamentals*

The essence of this analysis is based on a comparison of these concepts and associated phrases with the words and phrases used by focus group participants to articulate their responses to the facilitator’s question “What do you understand by the phrase *supply chain management*?” In all, 51 key words or phrases that relate to the *Four*

*Fundamentals* were used by participants: 21 in FG1; 15 in FG2; and, 15 in FG3 (see Figure 5.2(d)). Tables 5.1 to 5.4 show how these words and phrases were used in relation to each of the thirteen constituent elements that the *Four Fundamentals* comprise. In essence, each table shows how focus group responses are mapped against the key constituent concepts of each *Fundamental* in turn.

As shown in Table 5.1 all three focus groups specifically alluded to the need for a focus on customer needs generally, and on customer service issues specifically. FG3 emphasised the role of customer service as a source of strategic differentiation. Just one group (FG1) referred to SCM financial objectives (in terms of minimizing cost and improving efficiency). However, by introducing the “seven rights” FG2 also implicitly acknowledged the importance of the cost dimension. The need for simultaneous consideration of customer and financial objectives was acknowledged by FG1 and FG2 with their focus on value and the “seven rights”. With the exception of FG3’s absence of an explicit reference to financial objectives, a clear understanding of the main components of *Fundamental One* was evident across the focus groups.

	Customer Service	Total Supply Chain Investment and Cost	The Service/Cost Conundrum
FG1	Adaptable Enhanced service quality Timeliness Optimisation	Minimum cost Efficiency	Value
FG2	Focus on customer needs		"Rights"
FG3	Customer: service and other expectations Differentiation		

Table 5.1: *Fundamental One* and Focus Group Responses

Table 5.2 indicates that all groups had a strong emphasis on external integration with a variety of terminology being used to articulate this concept. FG1 did not discuss internal integration explicitly but it could be argued that the concept was implicitly referred to in their deliberations, particularly those that concerned the need for more integrated supply chain processes. FG2 made no mention of performance measurement but the other two groups, FG3 in particular, emphasized this aspect very strongly. Overall however, a clear understanding of the main components of *Fundamental Two* was evident across the focus groups.

	Internal Chain Integration	External Chain Integration	Performance Measurement
FG1		Network of companies Supply/demand synchronisation Source to customer Integration Processes Life cycle perspectives	Measurement
FG2	Process Organisational design Fragmentation to integration	Chain of activities Customer to customer via source	
FG3	Strategic and tactical Holistic Co-ordination	Cradle-to-grave End-to-end Supplier's supplier to customer's customer	Performance measurement

Table 5.2: *Fundamental Two* and Focus Group Responses

FG1 did not allude to the flow of money as being an element of SCM. With this exception, as shown in Table 5.3 each group recognized the role of materials, money and information flow management in the management of supply chains, thereby suggesting a clear understanding of the main components of *Fundamental Three*.

	Materials	Money	Information
FG1	Planning		Information flow management Visibility
FG2	Movement Flow of products	Flow of money	Control Flow of information
	Material movement and inventory management Reverse logistics	Money flows	Information flows

Table 5.3: *Fundamental Three* and Focus Group Responses

As shown in Table 5.4, all focus groups emphasised strongly the importance in SCM of relationships and their effective management. The trend towards outsourcing of supply chain functionality and the concomitant vertical disintegration of supply chain architectures was highlighted by just one group. The concept of “strategic partnering” and supply chain partnerships was not explicitly considered by any of the groups.



	Types of Relationships	Vertical Disintegration	Strategic Partnering	People Dimension
FG1	Relationships Alliances Communications			Teamwork
FG2	Interaction Interdependency	Outsourcing		
FG3	Interfaces Customer relationship management (CRM)			

Table 5.4: *Fundamental Four* and Focus Group Responses

However, this may be a terminology rather than a substantive issue. On reflection, comments made by the author during his presentation of the *Fundamental Four* may have inadvertently contributed to this in the case of FG1 and FG2<sup>36</sup>. In relation to the people dimension, in FG1 there was unanimity that better teamwork was the key to improving communication and building more effective relationships. With this exception, the other aspects of the people dimension of SCM (as set out in section 2.11.5) were not specifically alluded to by the groups. However, FG1 and FG3 did emphasise other aspects of the people dimension – as noted previously, FG1 noted the importance of *leadership* and *buy-in*, with FG3 emphasising *people and senior management* issues. This suggests that, with some omissions, the three focus group sessions show a clear understanding of the main components of *Fundamental Four*.

Overall, the great majority of the 13 key constituent concepts captured in the *Four Fundamentals* construct were recognized by the focus groups in answering the question: “What do you understand by the phrase *supply chain management*?”. Indeed, a number of issues not explicitly captured in the construct were highlighted by participants. Given the author’s contention that the *Four Fundamentals* represents a comprehensive definition of SCM, this analysis suggests that that a thorough understanding of the main elements of SCM is evident from the focus group sessions.

#### 5.4.3 *Four Fundamentals Construct Refinement*

Figure 5.8 (below) sets out those key words and phrases used by participants across all three focus groups that are not explicitly part of the author’s *Four Fundamentals*

<sup>36</sup> In his presentations to FG1 and FG2 the author proffered the opinion that “the word ‘partnership’ is probably one of the most abused words in the SCM lexicon”. However, this view was not expressed in the presentation to FG3.

construct. These are taken from Figures 5.2, 5.3 and 5.4 in relation to FG1, FG2 and FG3 respectively.

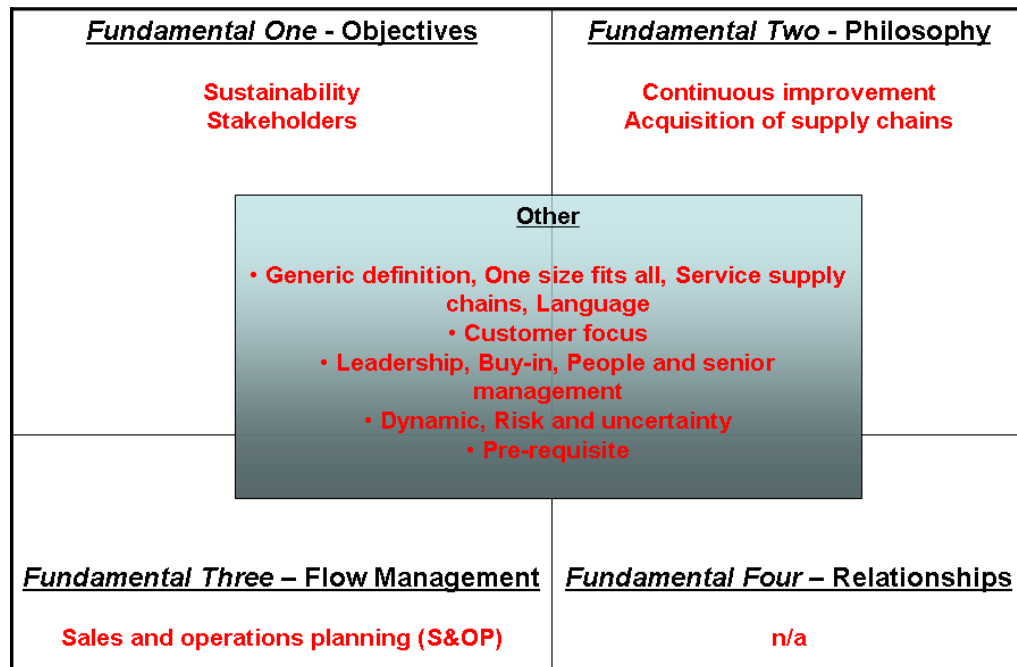


Figure 5.8: *Four Fundamentals* Refinement

#### Fundamental One

The first issue relates to sustainability, particularly from an environmental perspective. There is a need to more specifically and explicitly acknowledge that sustainability, along with the customer service and financial issues discussed earlier, is in itself a key objective of SCM. This is analogous to the so-called “triple bottom line” approach, a phrase originally coined by John Elkington (Elkington, 1979) and associated with Andrew Savitz (see, for example, Savitz, 2006), and focused on people, planet, and profit. A widely cited definition of sustainability is incorporated into the 1987 report of UN World Commission on Environment and Development (WCED), also known as the Brundtland Commission. This report – *Our Common Future* – defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland Commission, 1987, p. 54). This focus on meeting present needs without compromising the future is in essence what the concept of sustainability is about. Adapting this definition slightly provides a useful definition of a sustainable supply chain:

**A sustainable supply chain is a supply chain that meets the needs of the present without compromising the ability of future generations to meet their own needs.**

This definition recognises the fact that business activities can have detrimental effects on the planet's natural systems and encourages all actors in the wider supply chain to adopt policies and practices that promote environmental protection. The *Four Fundamentals* should be refined with this in mind.

A second issue not explicitly referred to in the *Four Fundamentals* is that of identification of *stakeholders*. The concept recognises that wider business objectives, as well as more specific SCM objectives, must be formulated with specific reference to an organisation's main stakeholders. A stakeholder in this context might be defined as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman, 1984, p. 46). The existing construct recognises that two of the key groups of stakeholders in any enterprise are owners (i.e. shareholders) and customers – hence the emphasis on financial and customer service objectives. In addition, by incorporating a sustainability-related objective the fact that wider society is a stakeholder in any firm is also recognised.

The author accepts that this is not an exhaustive list of the stakeholders of a typical enterprise. For example, employees and suppliers are also stakeholders in any organisation based on the above definition. As noted during FG1, regulatory bodies are important stakeholders in industries characterised by high levels of regulation such as in the pharmaceutical sector. Mitchell et al. (1997) recognise that a myriad stakeholders exist and that they are of greater or lesser importance depending on the nature of an organisation and its business environment.

The author therefore contends that the focus on owners (i.e. shareholders), customers and wider society is sufficient for the majority of situations in terms of specifying the main overall SCM objectives. Any attempt to develop an exhaustive list of stakeholders, and to identify the associated SCM objectives, would inevitably result in *Fundamental One* becoming very cumbersome, thus failing in the construct's attempt to provide a "concise and comprehensive" definition of SCM (see Chapter 2). This analysis also relates to an extent to the difficulties inherent in any attempt to develop a generic definition (see *Generic definition; One size fits all* below).

### *Fundamental Two*

One issue not explicitly referred to in the author's construct that emerged in both FG1 and FG3 as a possibly important aspect of SCM philosophy was that of *continuous improvement*. There was general agreement among FG1 participants that the culture of continuous improvement is an important dimension if the performance of a supply chain is to be sustained over a period of time. FG3 participants went further by positing the view that a robust performance measurement system, based on an agreed set of key performance indicators (KPIs), was important in this regard.

It was noted in Chapter 2 that traditionally supply chain activities have often been measured, and therefore managed, in isolation. The contention implicit in this statement is that fragmented approaches to measurement result in fragmented approaches to management, and that performance measurement provides a rational basis for any meaningful continuous improvement process. The author contends that for a definition of SCM it is not essential that the specific notion of continuous improvement is explicitly referred to. In section 2.14.5, the author made the point that, whilst the *Four Fundamentals* is primarily a comprehensive definitional construct, it does go beyond a purely definitional focus. Extending the construct further by incorporating concepts such as continuous improvement would take it further away from the intended definitional focus.

The strategic approach that involves the *acquisition of successful supply chains* by firms in sectors in which they wish to develop a presence was raised by one FG2 participant. As noted in section 5.2.2 (above) this reinforces the key element of *Fundamental Two* that "supply chains, not companies, compete".

### *Fundamental Three*

In relation to *Fundamental Three* the approach known as *sales and operations planning* (S&OP) was raised by FG3. As noted in section 5.2.3, the focus group itself concluded that, whilst this terminology was not explicitly used in the *Four Fundamentals*, S&OP was implicitly captured in the construct. The point is that supply chains have to properly planned with a strong focus on synchronising supply and demand and that this can only be achieved by planning sales and operational processes in an integrated way. These points are probably most closely associated with *Fundamental Three* but also find expression elsewhere in the author's construct.

#### *Fundamental Four*

No issues specifically relevant to *Fundamental Four* that are not explicitly captured by the construct were raised by participants in any of the three focus groups.

#### Other Issues

As noted in section 3.7.5, following the author's presentation of the *Four Fundamentals* construct, participants were asked to consider and comment on the validity of the construct in general terms, as well as on its specific applicability in their own sectors. These points, as discussed in earlier sections, are summarised as part of Figure 5.8 (above). A number of very similar issues emerged on a within-group and across-group basis. Such issues are grouped in Figure 5.8.

**Generic definition, One size fits all, Service supply chains, Language.** It was widely agreed that the development of a generic definition (i.e. one that is relevant in every detail to every firm in every sector) is a difficult task. The reality is that different drivers and strategic imperatives exist in every firm. Nonetheless, all participants agreed that all components of the construct were relevant to a greater or lesser extent in their organisations. However, there was a widely held view that the basic construct would need to be adapted somewhat in each individual company and sector to reflect specific concerns. One particular example of this that emerged strongly in FG3 and, albeit to a lesser extent, in FG1 and FG2, was the concern that the construct was heavily based on product supply chains. It was felt that the detail would need to be modified for the construct to find more resonance in service-oriented organisations. Related to this was a concern that the construct made extensive use of language and terminology associated with manufacturing industry. The author accepts these points and, in particular, the view that the basic construct needs to be adapted somewhat by each individual company and sector to reflect specific drivers and strategic imperatives.

**Customer focus.** Despite the fact that the concept of customer service “setting the spec” is a major element of *Fundamental One*, FG1 was strongly of the view that the concept needs to further emphasise the importance of customer focus. However, the author's reflection on this issue is that it is one of emphasis rather than of substance. This issue of emphasis may be related to the use of the word “supply” in the phrase “SCM” with

its implication of a focus on the buy side of the supply chain and an attendant supply-driven “push” orientation, i.e. rather than a demand-focused “pull” orientation.

**Leadership, Buy-in, People and senior management.** The role of leadership and senior management in developing appropriate supply chain strategies was emphasised in the discussions of FG1 and FG3, as was the related issue of employee involvement and “buy-in” to the supply chain change and improvement process. Overall, there was broad agreement that these people-related issues should be at the core of any worthwhile definition of SCM. The author agrees with these sentiments and would argue that the people dimension is explicitly dealt with in *Fundamental Four* (see section 2.11.5). On reflection, the author’s view is that the limited time available to him during each focus group session to provide an overview of the *Four Fundamentals* (about 20 minutes in total – see Table 3.4) did not, by definition, allow the construct to be fully explained in every detail and this to a large extent accounts for this particular issue. Furthermore, many of the issues raised by FG1 and FG3 regarding leadership and people issues digress from the purely definitional focus that is the author’s primary emphasis.

**Dynamic, Risk and uncertainty.** One FG2 participant raised the need for supply chains be dynamic, i.e. highly responsive to the changing business environment and to changes in customer requirements. As noted in section 5.2.2, some participants felt that this need for dynamism was implicit in the *Four Fundamentals* (in particular in *Fundamental One* with its emphasis on customer service). In any case (and again as noted in section 5.2.2) a consensus emerged that dynamism in this context was more an issue of good supply chain practice rather than something that needed to be explicitly captured in a definitional construct. Several FG2 participants raised the related issue of risk, uncertainty and resilience in a supply chain context, with a general consensus that the current economic environment is creating new challenges for individuals. In any case, the overall view was that these pressures did not impact directly on how SCM should be defined. The author’s reflection on these issues is that they will inevitably arise in any discussion of management practice in an economic climate that is characterised by turbulence, volatility and uncertainty but that the issues that arise do not need to be specifically reflected in an SCM definitional construct.

**Pre-requisite.** As noted in section 5.2.3, the specific question as to whether high levels of internal integration were a pre-requisite for external integration was raised by one participant during FG3. As further noted in section 5.2.3, whilst there was general agreement on a conceptual level about this point, participants struggled to illustrate this opinion with concrete practical examples. As noted in 2.9.2, this point is also analogous to the supply chain orientation (SCO) approach of Mentzer et al. (2001) in the sense that SCO at firm level, as manifested in high levels of internal integration, could be regarded as a prerequisite for SCM, as manifested in high levels of external integration. In any case, and as with the “*dynamic, risk and uncertainty*” category, this is more an issue of good supply chain practice rather than something that needed to be explicitly captured in a definitional construct.

## 5.5 Concluding Comments

It is important not to lose sight of the role of the focus group method, as set out in this Chapter, in answering RQ1. Notwithstanding the difficulties associated with the transferability of findings from a relatively small sample (i.e. 28 individuals in total), the author’s analysis suggests that a thorough understanding of the main elements of SCM is evident from the focus group sessions. The fact that participants were chosen from a range of different industry sectors and backgrounds, as well as being diverse from nationality and gender perspectives, enhances the author’s confidence in this assertion.

Section 5.4.3 relates to the use of the focus group method in refining the *Four Fundamentals* construct. The approach of all 28 informants across the three focus groups is broadly in line with the construct. This gives the author further confidence that it provides a rational basis for exploring in more detail the research questions set out in Chapter 2, in particular RQ2. The major refinement to the construct as a result of the focus group research involves adding a specific SCM objective in relation to environmental sustainability. The focus group work has also highlighted the difficulty of developing an SCM definition that is applicable to all firms in all sectors – the need for the basic construct to be adapted somewhat by each individual company and sector to reflect specific drivers and strategic imperatives has been emphasised.

RQ2 asks “What is the level of adoption of SCM”. Chapter 6 goes on to describe how this question was answered in phase III of the author’s research. This uses a questionnaire survey that adopts the refined *Four Fundamentals* construct as its basis.



## CHAPTER 6

### PHASE III: QUESTIONNAIRE SURVEY

#### 6.1 Background

As discussed in Chapter 3, a review of the methodological approaches used in previous empirical research in the SCM field reveals a strong emphasis on the use of single-method approaches with the great majority of studies making exclusive use of questionnaire surveys. The advantages of survey research are such that it will play a key role in the current research.

Notwithstanding some of the limitations associated with their use, the prime advantage of surveys is their efficiency in terms of speed and cost in generating large amounts of data that can be subjected to statistical analysis (Snow and Thomas, 1994). Moreover, as surveys are particularly useful when the research goal is to provide a description of the incidence or prevalence of a phenomenon (Yin, 1994), they represent an appropriate method of answering RQ2. This question, with its focus on assessing the level of adoption of SCM is – by definition – largely quantitative in nature. The survey also provides the opportunity to generate insights into the other three RQs. As part of this work, a survey is also an effective way of deductively testing the refined definitional construct (the *Four Fundamentals*).

The structure of this chapter is shown in Figure 6.1 (below).

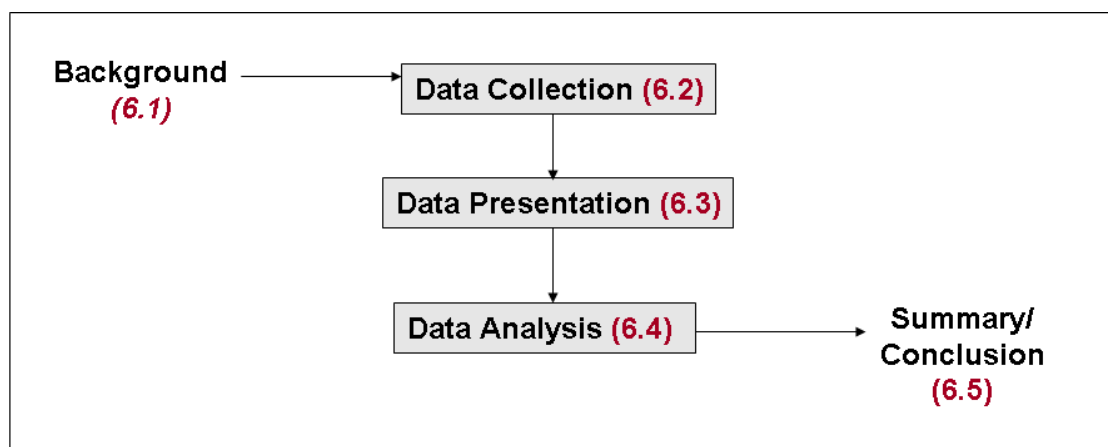


Figure 6.1: Structure of Chapter 6

The following sections describe the collection (section 6.2), presentation (section 6.3) and analysis (section 6.4) of survey data. The chapter concludes by making some general points by way of summary (section 6.5).

## 6.2 Data Collection

In line with the sampling design described in section 3.8.2, the the survey was administered over a four week period during late July and early August of 2011 to just over 1,000 sample firms. This comprised 1,000 firms across the 20 selected NACE categories, as well as a small number sent to “Healthcare” organisations – part of NACE Q (see section 3.8.2). In line with the stratified sampling approach adopted the number of firms contacted was as shown in Table 6.1 below.

<b>Sector</b>	<b>No.</b>	<b>%</b>
NACE 10 to 12 (Food products, beverages and tobacco)	40	4.0%
NACE 13,14 (Textiles and wearing apparel)	10	1.0%
NACE 16 (Wood and wood products, except furniture)	14	1.4%
NACE 17,18 (Paper and paper products; printing and reproduction of recorded media)	21	2.1%
NACE 20,21 (Chemicals and pharmaceuticals)	13	1.3%
NACE 22 (Rubber and plastic products)	16	1.6%
NACE 23 (Other non-metallic mineral products)	19	1.9%
NACE 24,25 (Basic metals and fabricated metal products)	40	4.0%
NACE 26,27 (Computer, electronic, optical and electrical equipment)	15	1.5%
NACE 28 (Machinery and equipment n.e.c.)	18	1.8%
NACE 29,30 (Transport equipment)	5	0.5%
NACE 31,32 (Furniture and other manufacturing)	27	2.7%
NACE 33 (Repair and installation of machinery and equipment)	4	0.4%
NACE E (Water supply; sewerage, waste management and remediation activities)	13	1.3%
NACE 45 (Motor trades)	70	7.0%
NACE 46 (Wholesale trade)	186	18.6%
NACE 47 (Retail trade)	322	32.2%
NACE H (Transportation and storage)	90	9.0%
NACE J (Information and communication)	73	7.3%
n/a (Healthcare)	10	n/a
NACE S (Other service activities)	4	0.4%
<b>Total</b>	<b>1010</b>	

Table 6.1: Final Sample

As noted earlier, the sampling frame used was based on NITL’s database which is regularly refined with a view to ensuring that email addresses are as up-to-date and accurate as possible. Nonetheless, a number of the emails were returned undelivered. In such cases, an alternative email address was selected at random from the sampling frame as a replacement and an additional email sent early in week three of the survey. Table 6.2 shows the number of emails returned to the author undelivered during these two phases of the study (“Returned Undelivered 1” and “Returned Undelivered 2” respectively).

Sector	No.	Returned		Returned	
		Undelivered 1	%	Undelivered 2	%
NACE 10 to 12 (Food products, beverages and tobacco)	40	1	2.5%	0	0.0%
NACE 13,14 (Textiles and wearing apparel)	10	2	20.0%	0	0.0%
NACE 16 (Wood and wood products, except furniture)	14	2	14.3%	0	0.0%
NACE 17,18 (Paper and paper products; printing and reproduction of recorded media)	21	0	0.0%	0	0.0%
NACE 20,21 (Chemicals and pharmaceuticals)	13	0	0.0%	0	0.0%
NACE 22 (Rubber and plastic products)	16	2	12.5%	0	0.0%
NACE 23 (Other non-metallic mineral products)	19	2	10.5%	0	0.0%
NACE 24,25 (Basic metals and fabricated metal products)	40	3	7.5%	1	33.3%
NACE 26,27 (Computer, electronic, optical and electrical equipment)	15	1	6.7%	0	0.0%
NACE 28 (Machinery and equipment n.e.c.)	18	1	5.6%	0	0.0%
NACE 29,30 (Transport equipment)	5	0	0.0%	0	0.0%
NACE 31,32 (Furniture and other manufacturing)	27	1	3.7%	0	0.0%
NACE 33 (Repair and installation of machinery and equipment)	4	0	0.0%	0	0.0%
NACE E (Water supply; sewerage, waste management and remediation activities)	13	0	0.0%	0	0.0%
NACE 45 (Motor trades)	70	8	11.4%	2	25.0%
NACE 46 (Wholesale trade)	186	20	10.8%	4	20.0%
NACE 47 (Retail trade)	322	35	10.9%	8	22.9%
NACE H (Transportation and storage)	90	9	10.0%	2	22.2%
NACE J (Information and communication)	73	8	11.0%	1	12.5%
n/a (Healthcare)	10	0	0.0%	0	0.0%
NACE S (Other service activities)	4	0	0.0%	0	0.0%
<b>Total</b>	<b>1010</b>	<b>95</b>	<b>9.4%</b>	<b>18</b>	<b>18.9%</b>

Table 6.2: Emails Returned Undelivered

Six of the 21 strata accounted for all 18 returned emails meaning that the survey reached just under 1,000 firms (992, i.e. 1,010 – 18). During the fourth and final week that the survey was live the author sent a reminder to all email addresses in the sample in a final effort to boost the response rate.

Figure 6.2 shows the response pattern over the four weeks (i.e. 20 working days) of the study. The three peaks coincide with the three main phases described above. There was a strong level of response after the initial mailing – Peak 1 – with half of the final number of usable responses received during the first five working days. Peak 2 coincides with the mailing of the replacement firms for those emails that were returned undelivered with Peak 3 representing a response to the final reminder.

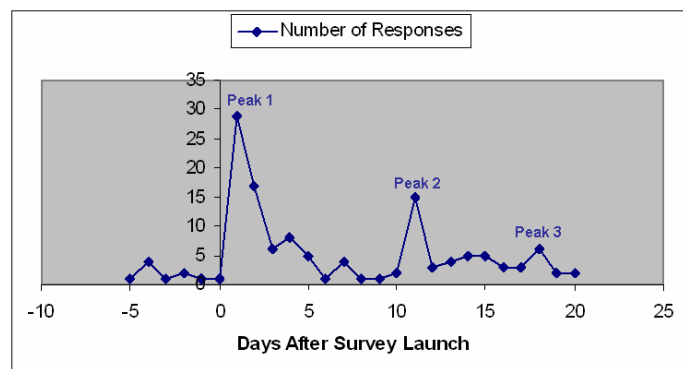


Figure 6.2: Survey Response Pattern<sup>37</sup>

<sup>37</sup> Note that some responses were received prior to the survey “go-live” date. These were the small number of usable responses – nine in total – from the 20 surveyed during the formal pre-test (see section 3.8.7).

The final number of usable responses was 132 giving a response rate of 13.1%. This is in line with modal response rates in previous empirical studies reviewed by the author (see Appendix 7) in which the majority of response rates were less than 20% with rates between 10 and 20% (39% of the total) being most common.

Figure 6.3 shows how the 132 responses break down by sector and Table 6.3 shows response rates by sector. The latter shows significant differences between sectors with very high response rates in certain sectors (for example, 80% in “computer, electronic, optical and electrical equipment” and over 60% in “chemicals and pharmaceuticals”) and correspondingly low response rates in others (for example, less than 10% in “wood and wood products, except furniture”, “wholesale trade” and “retail trade”).

The Irish Central Statistics Office (CSO) distinguishes between “modern” and “traditional” industries. The former includes, for example, NACE 20, 21, 26 and 27. Analysis of the responses received shows that these sectors had by far the highest response rates (61.5% for NACE 20, 21 and 80% for NACE 26, 27). In order to detect non-response bias, a number of non-respondents were contacted and there was no evidence of any significant non-response bias. A number of late respondents were also compared to earlier respondents – on the basis that late respondents are likely to share certain characteristics with non-respondents (see section 3.8.8) – and again no evidence of any significant differences was found.

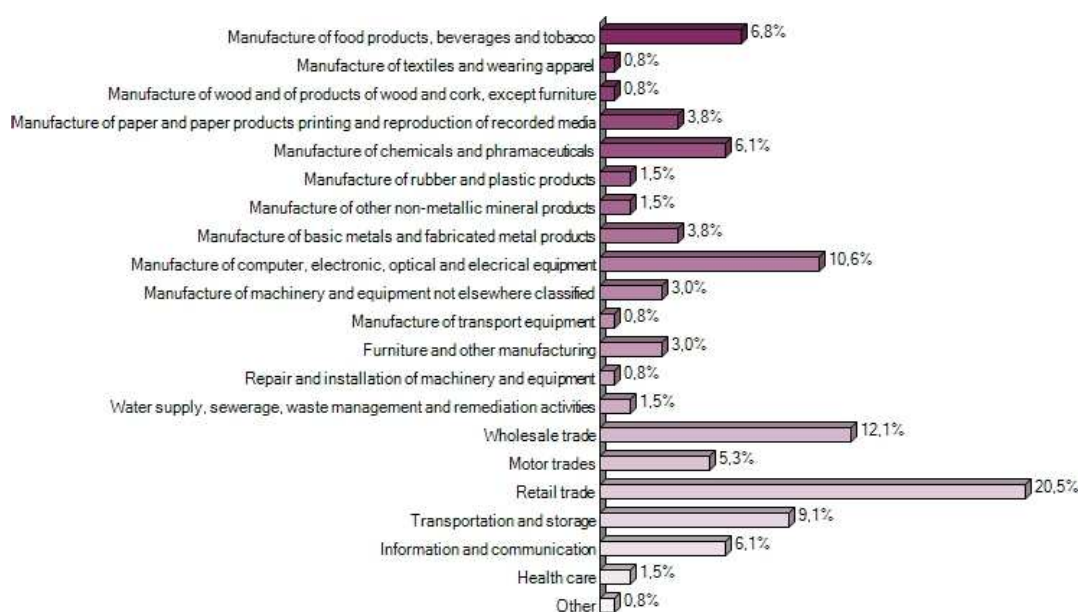


Figure 6.3: Responses by Sector

		Usable	
Sector	Sample	Responses	%
NACE 10 to 12 (Food products, beverages and tobacco)	40	9	22.5%
NACE 13,14 (Textiles and wearing apparel)	10	1	10.0%
NACE 16 (Wood and wood products, except furniture)	14	1	7.1%
NACE 17,18 (Paper and paper products; printing and reproduction of recorded media)	21	5	23.8%
NACE 20,21 (Chemicals and pharmaceuticals)	13	8	61.5%
NACE 22 (Rubber and plastic products)	16	2	12.5%
NACE 23 (Other non-metallic mineral products)	19	2	10.5%
NACE 24,25 (Basic metals and fabricated metal products)	40	5	12.5%
NACE 26,27 (Computer, electronic, optical and electrical equipment)	15	12	80.0%
NACE 28 (Machinery and equipment n.e.c.)	18	5	27.8%
NACE 29,30 (Transport equipment)	5	1	20.0%
NACE 31,32 (Furniture and other manufacturing)	27	5	18.5%
NACE 33 (Repair and installation of machinery and equipment)	4	1	25.0%
NACE E (Water supply; sewerage, waste management and remediation activities)	13	2	15.4%
NACE 45 (Motor trades)	70	7	10.0%
NACE 46 (Wholesale trade)	186	16	8.6%
NACE 47 (Retail trade)	322	27	8.4%
NACE H (Transportation and storage)	90	12	13.3%
NACE J (Information and communication)	73	8	11.0%
n/a (Healthcare)	10	2	20.0%
NACE S (Other service activities)	4	1	25.0%
<b>Total</b>	<b>1010</b>	<b>132</b>	<b>13.1%</b>

Table 6.3: Response Rates by Sector

## 6.3 Data Presentation

### 6.3.1 Questionnaire Section 1: Background

The first part of this section comprised three open questions:

- What is meant by the term “supply chain”?
- What is meant by the term “supply chain management (SCM)”?
- What is meant by the term “logistics”?

Usable responses were received from all respondents with a wide variety of words and phrases used to define the three terms.

Responses to question 4 were provided by all but one respondent with the great majority (87.8%) regarding logistics as part of SCM (see Figure 6.4).

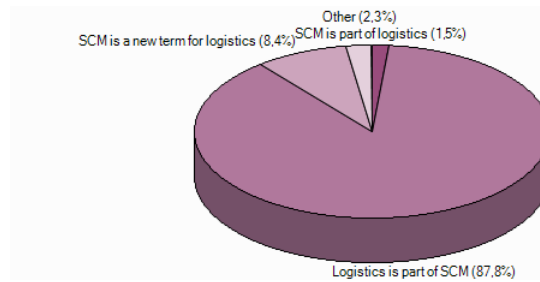


Figure 6.4: Relationship Between SCM and Logistics

The next question used a five-point Likert scale to solicit the reaction of respondents to the statement: the language and terminology used to define SCM contributes to confusion in understanding. Of the 131 that responded, a clear majority (57.5%) either “agreed” or “agreed strongly” with this statement, while very few (1.5%) “disagreed strongly” (see Figure 6.5).

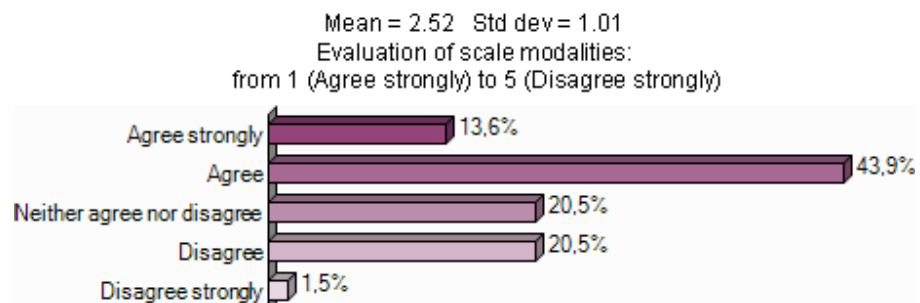


Figure 6.5: Language and Terminology Used to Define SCM

The final question in the first section of the questionnaire asked whether single-sentence definitions were of value. Figure 6.6 shows a breakdown of the 131 responses received.

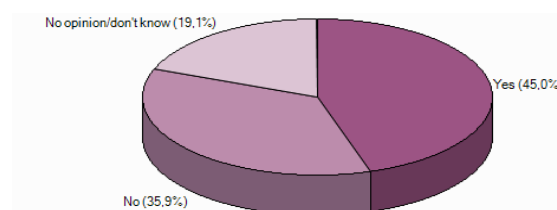


Figure 6.6: Value of Single-Sentence Definitions of SCM

This indicates that more respondents regard such definitions of value than do not (45.0% compared with 35.9%) but that a significant number (19.1%) have no opinion.

### 6.3.2 Questionnaire Section 2: SCM Objectives (Fundamental One)

The nine questions in this section relate to SCM objectives – specifically: background, customer service, total supply chain cost and investment, and the service/cost conundrum.

#### Background

Question 7 asked if specific SCM objectives were formulated. As shown in Figure 6.7, of the 132 responses received a clear majority (59.1%) responded in the affirmative.

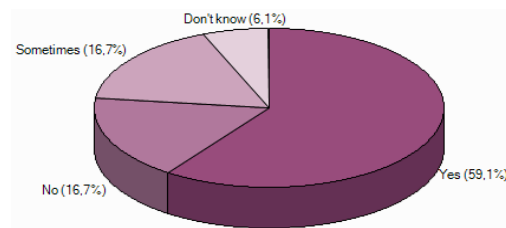


Figure 6.7: Formulation of Specific SCM Objectives

Where specific SCM objectives are formulated they relate to the areas shown in Figure 6.8. In line with classical approaches to SCM the majority of respondents focus on customer service (70.5%) and cost (67.4%) objectives.

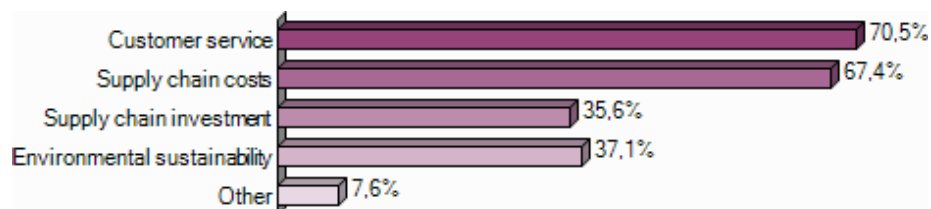


Figure 6.8: Focus of SCM Objectives

#### Customer Service

Question 8 asked respondents to rank customer service, price and product quality in order of importance (1 = most important; 3 = least important) to customers in markets served by their companies. Table 6.4 shows the number and percentage of firms that ranked the three factors. Of most significance is the relative importance attached to each of the factors with “Importance” varying from 1 to 3 and calculated as the mean rank of the modality. Interestingly, customer service is ranked as the most important (1.72) and price as the least (2.22).

<b>Factor</b>	<b>No.</b>	<b>%</b>	<b>Importance</b>
Customer service	125	94.7%	2.22
Price	125	94.7%	1.72
Product quality	124	93.9%	2.01
<b>Total</b>	<b>132</b>		

Table 6.4: Relative Importance of Customer Service, Price and Product Quality

Question 9 asked if customer service audits were used to understand customer expectations and the performance of competitors. As shown in Figure 6.9 the majority (62.1%) indicated that they do use such audits.

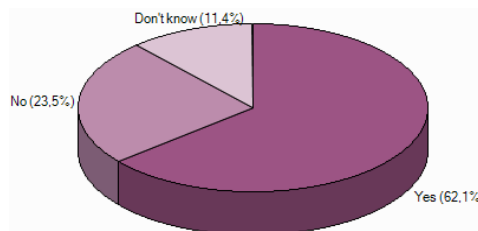


Figure 6.9: Use of Customer Service Audits

Question 10 asked which elements of customer service were measured in respondents' organizations. Figure 6.10 shows that on-time delivery (84.1%) and product availability (78.0%) are most commonly measured. They are followed by length (57.6%) and consistency (53.0%) of order cycle time, with documentation accuracy (40.2%) and information request responsiveness (37.0%) lagging behind.

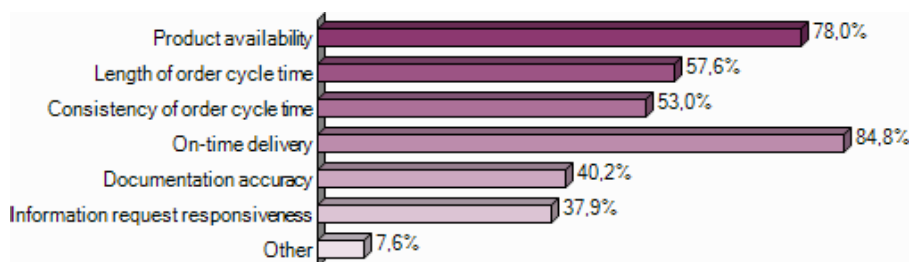


Figure 6.10: Elements of Customer Service Measured

Question 11 then used a five-point Likert scale to solicit the reaction of respondents to the statement: understanding customer service sets the specification for SCM/supply chain design. The responses are shown in Figure 6.11 and indicate that the great majority (81.8%) either "agree" or "agree strongly" with this assertion with few demurring (3%).



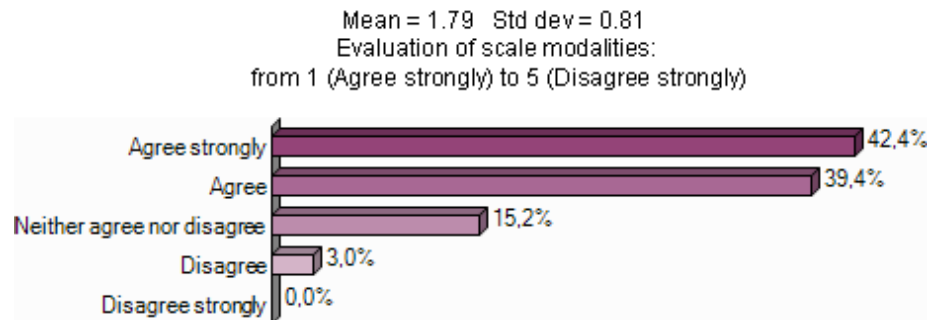


Figure 6.11: Customer Service and SCM/Supply Chain Design

### Total Supply Chain Cost and Investment

Question 12 asked if firms measured “total supply chain cost” and Figure 6.12 shows the responses. A minority of respondents (22.7%) answered in the affirmative with a significant number in the “don’t know/no opinion” category.

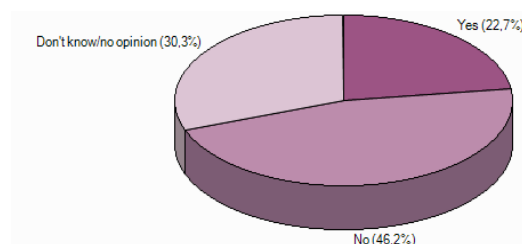


Figure 6.12: Measuring “Total Supply Chain Cost”

Figure 6.13 shows the costing methodologies employed in the respondents’ firms. The great majority use formal approaches with activity-based costing (ABC) the most widely used (42.4%). The only usable response amongst those who answered “other” was “cost-to-serve”.

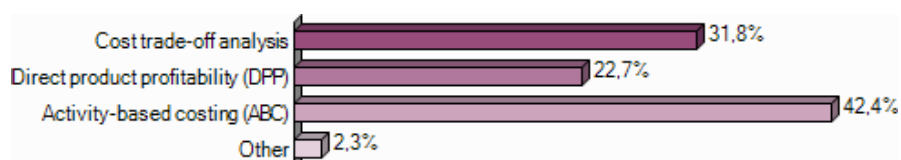


Figure 6.13: Supply Chain Costing Methodologies

### The Service/Cost Conundrum

The final question in this section used a five-point Likert scale to solicit the reaction of respondents to a statement: cost/investment optimisation and customer service

optimisation are mutually exclusive. The responses are shown in Figure 6.14 and a clear majority (53.8%) either “disagreed” or “disagreed strongly”.

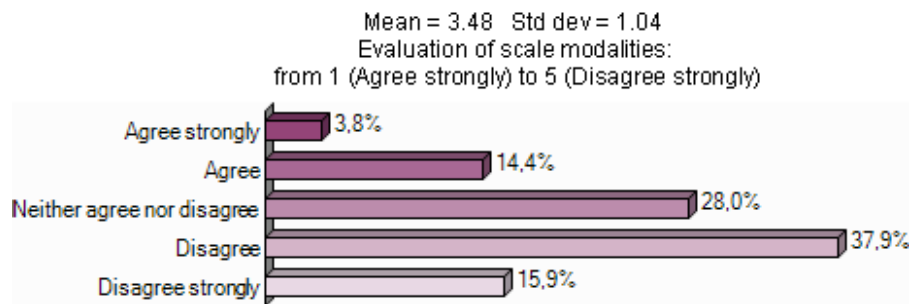


Figure 6.14: The Service/Cost Conundrum

### 6.3.3 Questionnaire Section 3: Supply Chain Integration (Fundamental Two)

The six questions in this section relate to background, internal integration, external integration and performance measurement.

#### Background

The first question in relation to integration used a five-point Likert scale to solicit the reaction of respondents to a statement: SCM is fundamentally concerned with integration of supply chain activities. The responses are shown in Figure 6.15 with the great majority of respondents (82.5%) in either the “agree strongly” or “agree” categories.

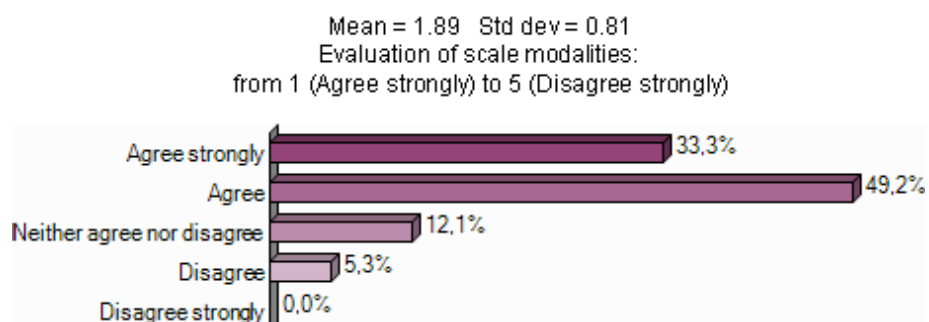


Figure 6.15: Importance of Integration in SCM

Question 16 then asked respondents to rank the four levels of integration posited by Fawcett and Magnan (2002) in order of importance (1 = most important; 4 = least important). Table 6.5 shows the number and percentage of firms that ranked the four levels. Of most significance is the relative importance attached to each of the factors with “Importance” varying from 1 to 4 and calculated as the mean rank of the modality.

Backward integration (i.e. with suppliers) is regarded as the most important (2.16) with internal regarded as least important (2.79).

<u>Level of Integration</u>	<u>No.</u>	<u>%</u>	<u>Importance</u>
Non response	4	3.0%	0.00
Internal cross-functional integration	127	96.2%	2.79
Backward integration with valued first-tier suppliers	126	95.5%	2.16
Forward integration with valued first-tier customers	127	96.2%	2.47
Complete backward and forward integration ('from the supplier's supplier to the customer's customer')	126	95.5%	2.49
<b>Total</b>	<b>132</b>		

Table 6.5: Importance of Different Levels of Integration

### Internal Integration

The only question that related specifically to internal integration used a five-point Likert scale to assess the extent to which the internal supply chain activities in respondents' firms were integrated. The responses are shown in Figure 6.16 with the great majority of respondents indicating that internal activities were either "highly integrated" or "somewhat integrated".

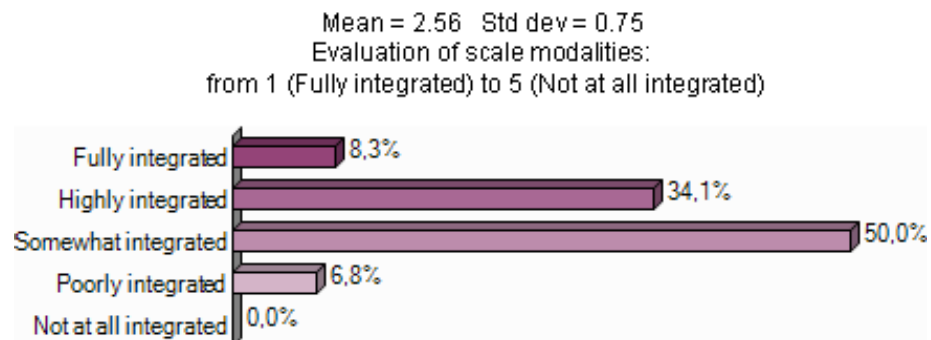


Figure 6.16: Extent of Internal Integration

### External Integration

The next two questions in this part of the questionnaire used the same five-point Likert scale as used in the previous question to assess the level of integration with customers and suppliers respectively. The responses are shown in Figures 6.17 and 6.18. As with internal integration, the great majority of respondents indicated that their firms' activities were either "highly integrated" or "somewhat integrated" with those of their customers and suppliers respectively.

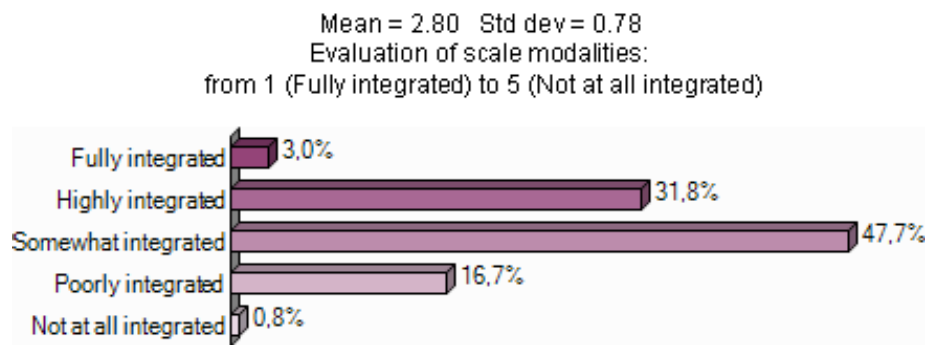


Figure 6.17: Extent of Integration with Customers

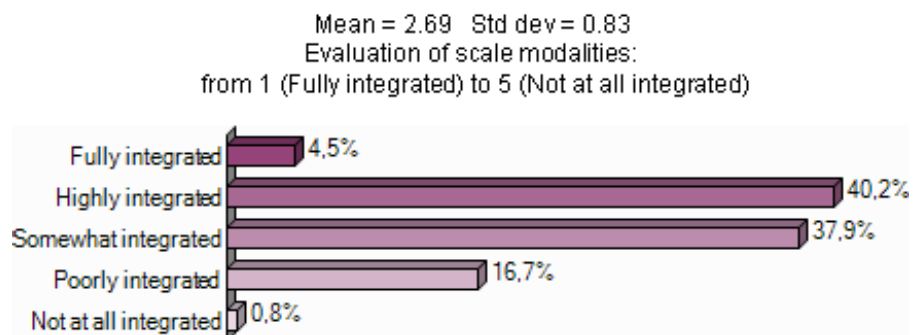


Figure 6.18: Extent of Integration with Suppliers

#### Performance Measurement

The final question in this section asked respondents to indicate what supply chain KPIs are used in their organizations. As might be expected the 103 responses received varied greatly in terms of the detail provided but suggested that a wide range of KPIs are in use.

#### ***6.3.4 Questionnaire Section 4: Supply Chain Flow Management (Fundamental Three)***

The questions in this section relate to material, money and information flows. The first three questions used a five-point Likert scale to assess how well these flows were managed. The responses are as shown in Figure 6.19 with a small minority indicating that material (5.3%), financial (9.1%) and information (9.1%) flows were either “poorly” or “very poorly” managed.

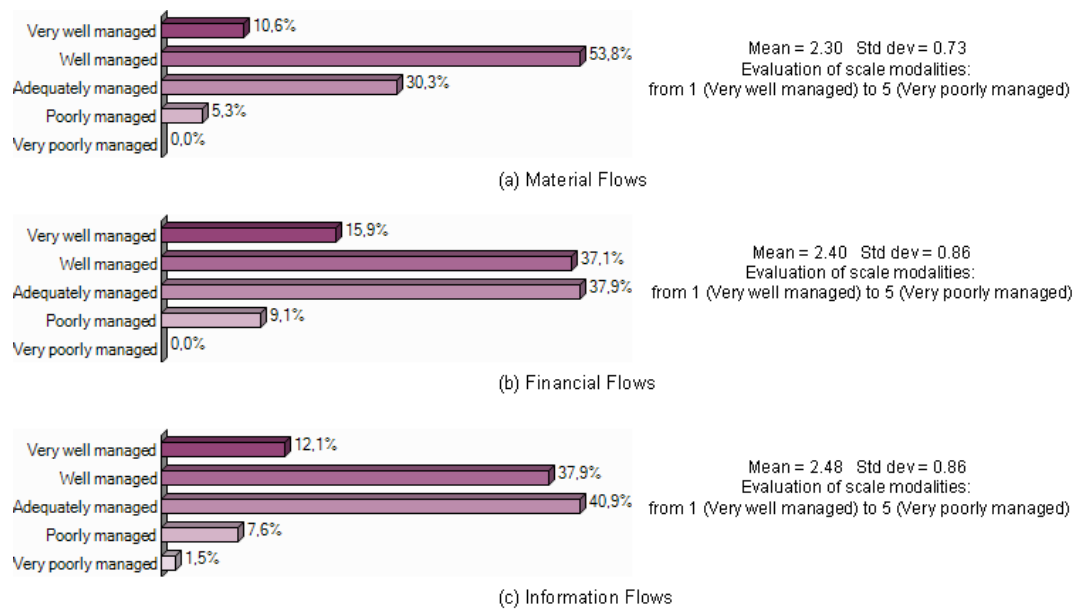


Figure 6.19: Flow Management

Question 24 then asked about the ICT tools used to support the management of supply chain information flows. As shown in Figure 6.20, the majority of firms indicated that they used enterprise solutions (i.e. ERP) with significant numbers using WMS (43.9%), MRP (40.9%), TMS (31.8%) and manufacturing planning systems (28%).

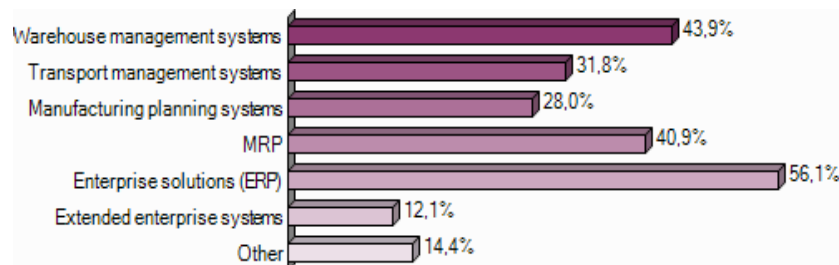


Figure 6.20: ICT Tools Used

### 6.3.5 Questionnaire Section 5: Supply Chain Relationships (Fundamental Four)

Three questions that are concerned with supply chain relationships adopted a five-point Likert scale to assess the strength of relationships internally, as well as with external customers and suppliers. As shown in Figure 6.21, in all three cases the majority of respondents assessed the relationships as “strong” (58.3%, 53.8% and 53.8% respectively).

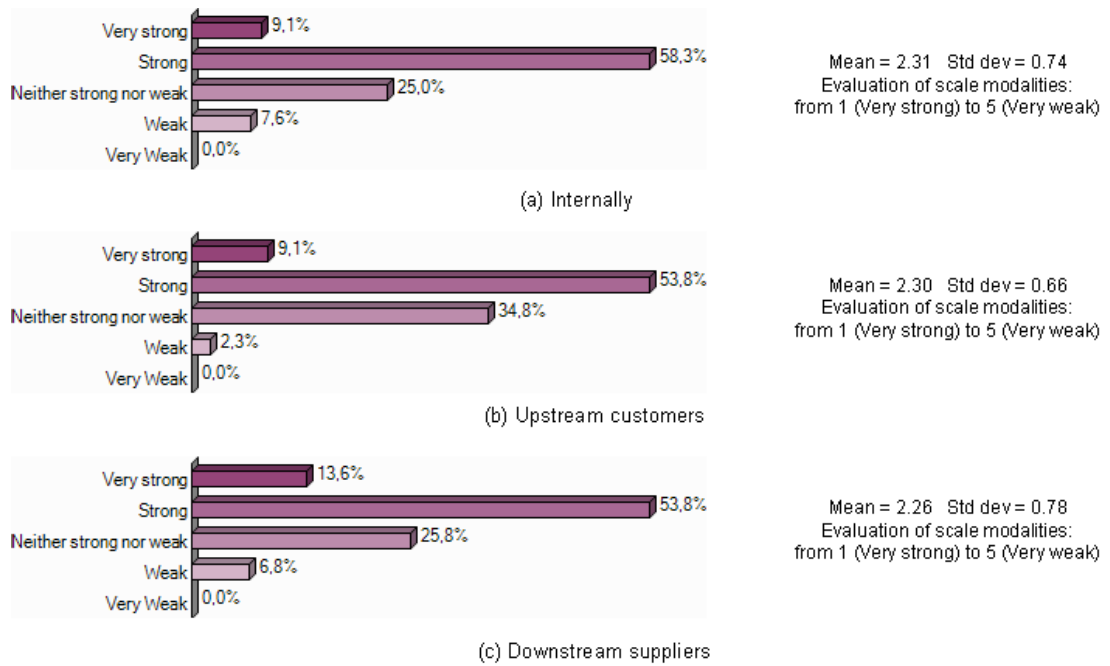


Figure 6.21: Nature and Extent of Relationships

### 6.3.6 Questionnaire Section 6: Supply Chain Improvement

Three questions in relation to improvement initiatives were asked in this part of the questionnaire.

Question 28 asked if any major supply chain improvement initiatives had been implemented in the last two years and question 29 if any such initiatives were planned in the next two years (see Figure 6.22).

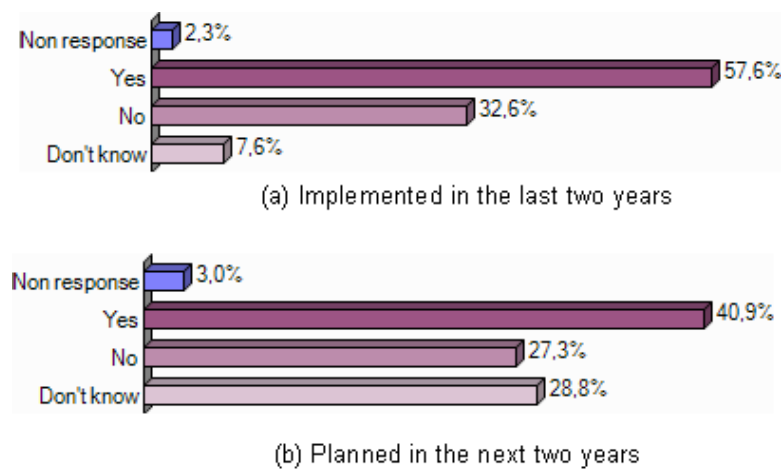


Figure 6.22: Major Supply Chain Improvement Initiatives

The final question asked if there are any policy initiatives that could be adopted to facilitate the wider adoption of SCM. A wide range of suggestions was evident across the 28 usable responses.

### 6.3.7 Respondent Information

The number of responses received by sector (i.e. NACE category) was discussed in section 6.2. Figure 6.23 shows information about the size of responding companies by number of employees, annual turnover and balance sheet total. As a result of the large proportion of “don’t know” responses in relation to balance sheet total, it is impossible to reliably categorise all firms using the EU definition of firm size. For analysis purposes, firm size will therefore be based on number of employees (as shown in Figure 6.23(a)). This results in slightly fewer firms being in the “large” and “medium” categories and proportionately more being in the “small” category than would be the case using the EU definition. This is because, in addition to the staff headcount ceilings, the size an enterprise in the EU taxonomy is based on either the turnover ceiling or the balance sheet ceiling, but not necessarily both. The high proportion of responses from SMEs is encouraging given the well documented difficulties in getting responses from smaller firms (see, for example, Harzing, 2000).

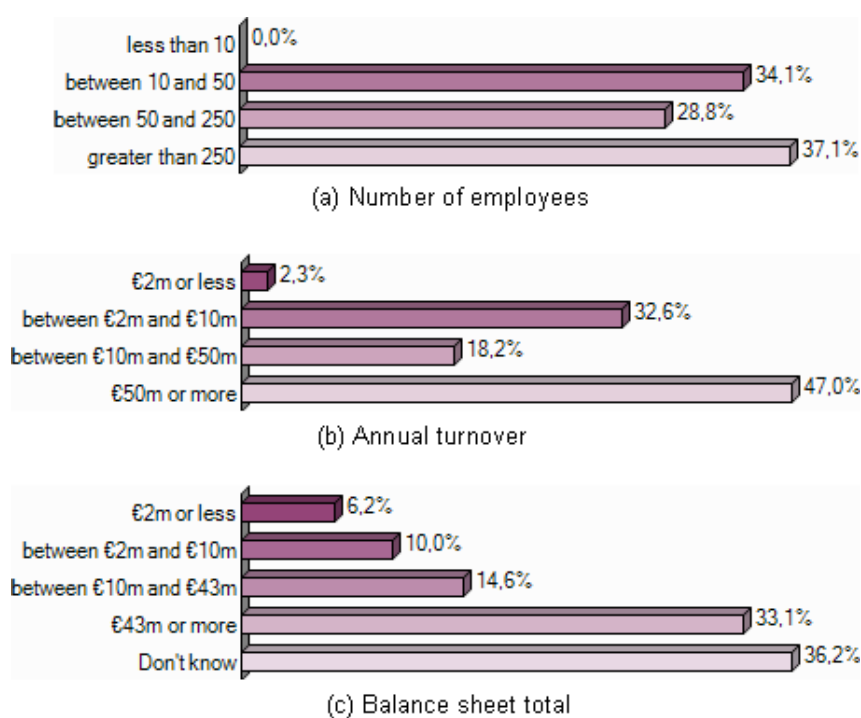


Figure 6.23: Size of Respondents' Firms

Figure 6.24 shows the ownership of respondents' firms with over half being indigenously owned companies. Figure 6.25 shows the location of the company's HQ for the 58 multinational firms.

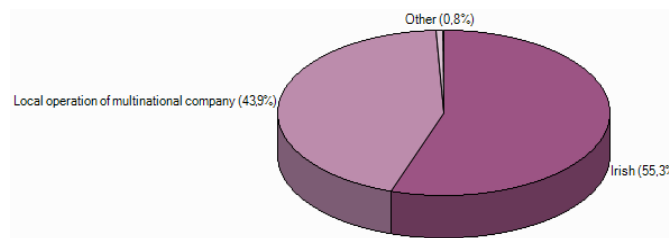


Figure 6.24: Ownership of Respondents' Firms

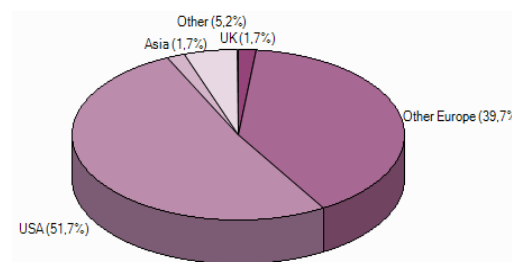


Figure 6.25: Headquarters of Multinational Firms

Finally in terms of demographics, respondents were asked about their professional backgrounds. Figure 6.26 shows the responses provided with “end-to-end SCM” the most commonly indicated response.

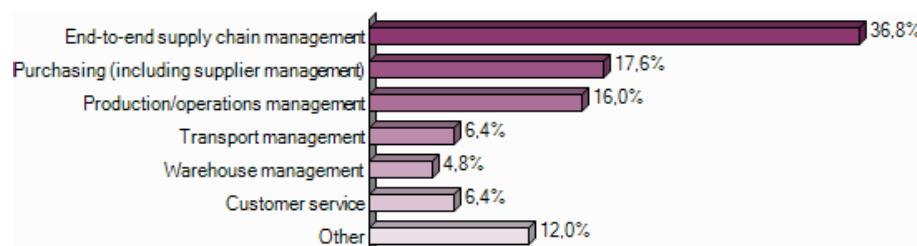


Figure 6.26: Respondent Professional Background

A detailed analysis of the linkages between various demographic data is shown in Appendix 13. This focuses mainly on the demographic factors used in the data analysis in section 6.4 – sector, firm size, firm ownership and respondent background. Some of the main findings from this analysis are:

- Firm size varies significantly across sectors with, for example, a large number of small firms in the retail trade (with a proportionately small number of large firms);



- Firm ownership varies significantly across sectors with a strong multinational presence in certain sectors (e.g. computers and electronics);
- The way in which respondents describe their professional backgrounds varies significantly across sectors (for example, “end-to-end SCM” is very prevalent in technology-oriented sectors such as “chemicals and pharmaceuticals”, “computer, electronic, optical and electrical” and “information and communications”); and,
- The majority of small firms are indigenous while the majority of large firms are local operations of multinationals.

### ***6.3.8 Reflection and Summary***

A number of points are worth highlighting at this stage. Firstly, the clear majority of respondents in agreement with the idea that the language and terminology used to define SCM contributes to confusion, backs up the author’s contention that a new definitional construct is desirable. Secondly, the significant number of respondents who are unconvinced by the value of single-sentence definitions of SCM adds weight to the author’s contention that any such construct needs “to concisely, yet comprehensively, define the essence of SCM” (see section 2.7). Thirdly, the fact that almost 90% of respondents describe themselves as “unionist” in the Larson and Halldorsson (2004) taxonomy, is in line with the broad thrust of the author’s proposed definition (i.e. the *Four Fundamentals*). Fourthly, the significant number of firms formulating SCM objectives that relate specifically to environmental sustainability reinforces the author’s refinement of the definitional construct (i.e. the addition of this dimension to the traditional service/cost orientation) based on the focus group work described in Chapter 5.

An initial reflection on and analysis of the data presented in this section points to a mixed picture in relation to SCM adoption by firms in Ireland. These and other issues are explored in more detail based on a more thorough analysis of the data in the following section (section 6.4).

## **6.4 Data Analysis**

### ***6.4.1 Questionnaire Section 1: Background***

The first three questions were open questions:

- What is meant by the term “supply chain”?
- What is meant by the term “supply chain management (SCM)”?
- What is meant by the term “logistics”?

Usable responses were received from the majority of respondents with a wide variety of words and phrases used to define the three terms.

#### What is meant by the term “supply chain”?

An initial content analysis of the responses to this question was carried out by looking at the frequency of occurrence of particular words and phrases. The software provides a simple list of the most frequently occurring words. This was carefully analysed by the author, paying particular attention to:

- ignoring unimportant words (such as definite and indefinite articles, prepositions and conjunctions);
- amalgamating the singular and plural forms of words; and,
- linking words that are effectively synonyms for analysis purposes (e.g. “make”, “manufacture” and “produce”).

Despite the relatively unscientific nature of this analysis, the 25 most frequently occurring words shown in the word cloud in Figure 6.27 provides some insights into how respondents define the term “supply chain”. Interestingly, the two most frequently used words were “customer” and “supplier” with the former used by 50% more respondents than the latter. This indicates a higher prevalence of customer-focussed (or “pull”) – as opposed to supplier-focussed (or “push”) – orientations among respondents.

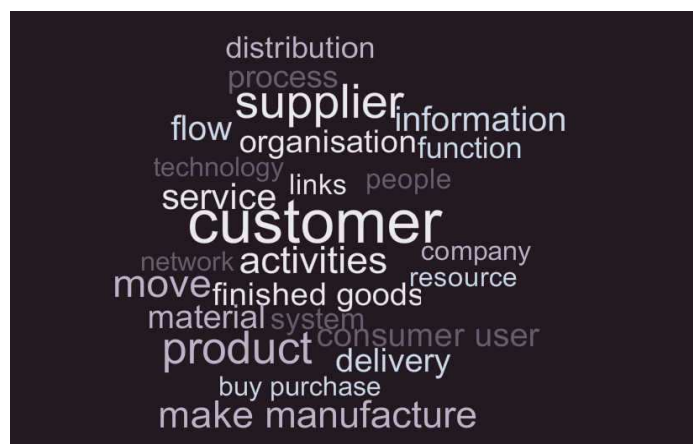


Figure 6.27: Words Used to Define “Supply Chain”

Further analysis of the 120 usable responses was based primarily on the distinction between internal (i.e. intra-firm) and external (i.e. inter-firm) chains as set out in section 2.9. The primary emphasis of the responses is shown in Figure 6.28. Almost two thirds of respondents defined the supply chain as being inter-firm (i.e. external). In this context, several respondents used the term “distribution channel” with other phrases such as “network”, “pathway” and “pipeline” also being used. Several respondents specified the types of firms that typically comprise an external chain (e.g. “manufacturer”, “wholesaler”, “retailer”, etc.).

Of those respondents who indicated that the supply chain is primarily intra-firm (i.e. internal), several specified the functions that comprise such a chain (e.g. purchasing, manufacturing, transport, etc.). As indicated in Figure 6.28 a number of respondents alluded to both internal and external chains and specified the distinction between them. For example, one respondent from the electronics sector stated:

“(i) A group of companies ultimately delivering a product to the final consumer; and, (ii) A ‘chain’ of internal functions (e.g. production, logistics, etc.) working together”.

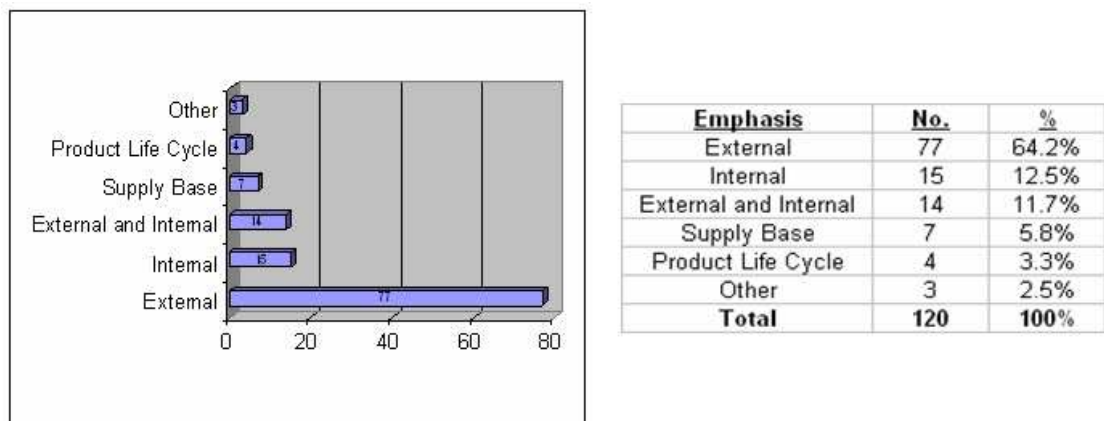


Figure 6.28: Supply Chain Definitions

A small number of respondents stated that the supply chain was essentially the suppliers that they interacted with. Interestingly, all such responses came from firms in either the retail or motor sectors. One typical response from a retailer was: “The events and activities that result in product being delivered to us”. Another small group of respondents provided definitions of the supply chain that adopted a product life cycle orientation with one typical definition stating that the “supply chain incorporates all the activities which are involved in bringing a product from the stage of inception to the

stage of delivery to the end user”. The responses in the “other” category provided relatively narrow definitions of the supply chain with one response from the transport sector stating that it is “a new word for transport and logistics”.

Perhaps inevitably, a number of the responses tended to describe SCM as opposed to the supply chain itself. For example, one respondent stated that: “supply chain is an end to end process responsible for delivering a product/service in a satisfactory manner to the consumer”. In most such cases, the answers provided by respondents to question 2 – What is meant by the term “supply chain management (SCM)” – referred back to the response to question 1.

#### What is meant by the term “supply chain management (SCM)”?

As with the previous question, an initial content analysis of the responses to this question was carried out by looking at the frequency of occurrence of particular words and phrases and the 25 most frequently occurring words are shown in Figure 6.29.



Figure 6.29: Words Used to Define “Supply Chain Management”

As with the previous question, the word “customer” occurs most frequently. Not surprisingly, the majority of the words/phrases are identical to those used to define “supply chain”. The new words/phrases that are used by respondents include: “finance/cash/money”, as well as “cost” and “value”; “right”, reflecting the classic “seven rights” approach to defining logistics/SCM (see, for example, Lambert and Stock (1992)) including right “time”; “relationship”, as well as “holistic” and “integration”; “internal”; and “strategic”.

Further analysis of the 131 usable responses was based primarily on categorising responses in relation to the author's *Four Fundamentals* construct. All responses were assigned one or more of the numbers, 1, 2, 3 and 4, based on the emphasis of the definition and the words/phrases used by respondents. For example, one response was:

“SCM is incorporated to maintain effective integration throughout the whole channel of distribution while facilitating constant and accurate information to everyone involved in the transfer of materials, information, and money.”

The use of the word “integration” is in line with *Fundamental Two* and there is also specific reference to materials, information and money flows as set out in *Fundamental Three*. This response is, therefore, coded “2, 3”. A small number of responses were impossible to categorise in this manner. Figure 6.30 shows how the words/phrases used align with the *Four Fundamentals*.

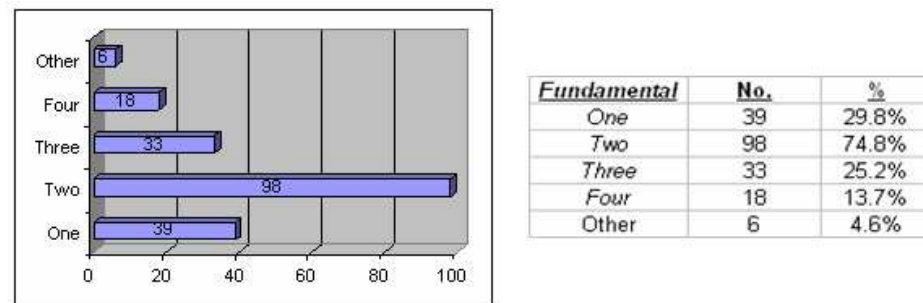


Figure 6.30: Supply Chain Management Definitions

Almost three quarters of respondents alluded to the need for different links in the supply chain to work together properly in line with the SCI concept articulated in *Fundamental Two*. As shown in Figure 6.29, the use of words such as “process”, “network”, “link”, “holistic” and (perhaps most importantly) “integration” is in line with this emphasis. Almost 30% of respondents made reference to supply chain objectives and, more specifically, the need to optimise customer service and/or cost performance (as outlined in *Fundamental One*). Approximately one quarter of respondents alluded to the management of flows as set out in *Fundamental Three*. Just 13.7% of respondents made specific reference to the notion of relationships between actors in the supply chain. Most respondents in the “other” category adopted a narrow view of SCM with several – again mainly from the retail and motor sectors – stating that SCM was simply about the management of suppliers and the supply base.

What is meant by the term “logistics”?

As with the previous questions, an initial content analysis of the responses to this question was carried out by looking at the frequency of occurrence of particular words and phrases and the 25 most frequently occurring words are shown in Figure 3.31.



Figure 6.31: Words Used to Define “Logistics”

The concepts of “movement” and “transport” of “materials” through the chain (i.e. from “(point of) origin” to “(point of) consumption”), as well as “storage/warehousing”, are prevalent. Other words associated specifically with the “move” and “store” links in the supply chain (e.g. “distribution” and “inventory/stock”) also appear. Again, the majority of the words/phrases are identical to those used to define “supply chain” and “supply chain management”. The new words/phrases that are used by respondents include “effective” and “efficient” indicating that respondents regard logistics as being fundamentally concerned with the effective and efficient movement and storage of product.

Further analysis of the 125 usable responses was based on the primary emphasis of respondents and is shown in Figure 6.32. In line with Figure 6.31, the great majority indicated that logistics is primarily concerned with transportation (i.e. “move”) and/or transportation and storage (i.e. “move/store”) in the supply chain. 9.6% of respondents referred to “material flows” and their management in a supply chain context, while 12% took a broader view and alluded to the management of a wider set of flows. One example of the latter is a respondent who defined logistics as “the management of the flow of information, product and finance”. A number of respondents specifically noted that logistics was concerned with operational issues associated with the “execution” of the supply chain; one respondent, for example, stated that logistics is “making sure that

the supply chain is working properly – the grease that lubricates the supply chain”. Four respondents felt that logistics was the same as SCM and another four alluded to the “seven rights” of logistics/SCM or variants thereof. Most of the respondents in the “other” category took a broader view of logistics; one respondent, for example, defined logistics as “a channel of the supply chain which adds the value of time and place utility”.

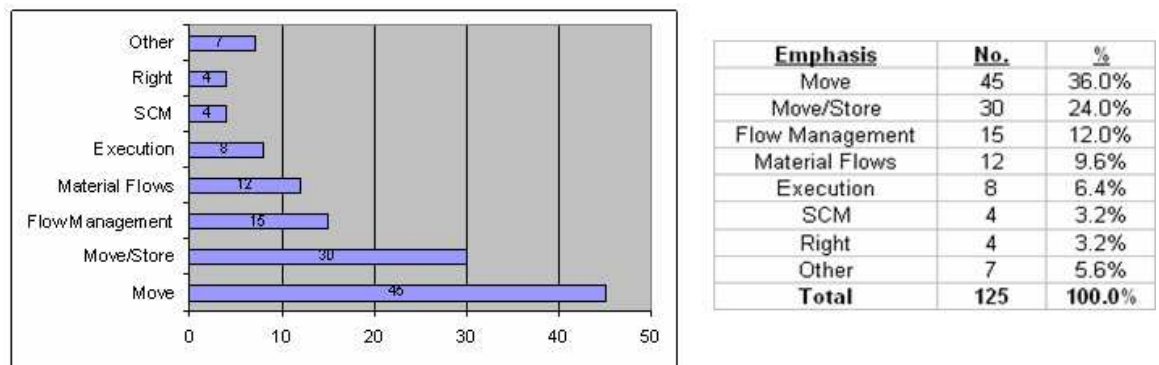


Figure 6.32: Logistics Definitions

#### Relationship between SCM and Logistics

As shown earlier in Figure 6.4, the great majority of respondents (87.8%) regard logistics as part of SCM. The data were analysed to test for any differences based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background.

The  $\chi^2$  test indicates that no significant differences exist (NS) by sector. Analysis of the data by company size based on the number of employees using the  $\chi^2$  test indicates a slightly significant dependence (LS). This is accounted for by the relatively large number of small firms (i.e. between 10 and 50 employees) who deemed SCM to be part of logistics (two firms) or SCM to be a new term for logistics (seven firms).

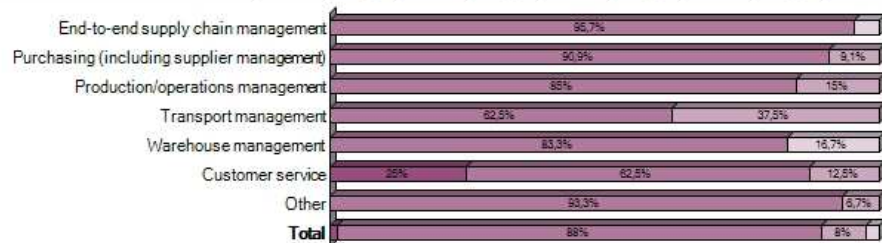
The  $\chi^2$  test indicates that no significant differences exist between indigenous and multinational firms. Figure 6.33 shows the data based on the professional background of respondents with the  $\chi^2$  test suggesting that highly significant differences exist (VS). This is largely accounted for by two factors. Firstly, the only two respondents who suggested that SCM is part of logistics were both from a customer service background. Secondly, three respondents from a transport management background indicated that SCM was a new name for logistics. This represents a relatively high proportion of: (i) all respondents who responded thus (30%); and, (ii) the total number of respondents



describing their professional background as transport management (37.5%). This can be seen in the factor map of the cross tabulation (see Figure 6.34) that shows clear linkages between: (i) customer service and “SCM is part of logistics”; (ii) transport management and “SCM is a new term for logistics”; and, (iii) warehouse management and “Other”.

**4. Which of the following statements best describes the relationship between SCM and logistics?**  
Which of the following best describes your professional background?

	SCM is part of logistics		Logistics is part of SCM		SCM is a new term for logistics		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	0	0,0%	44	95,7%	0	0,0%	2	4,3%	46	100,0%
Purchasing (including supplier management)	0	0,0%	20	90,9%	2	9,1%	0	0,0%	22	100,0%
Production/operations management	0	0,0%	17	85,0%	3	15,0%	0	0,0%	20	100,0%
Transport management	0	0,0%	5	62,5%	3	37,5%	0	0,0%	8	100,0%
Warehouse management	0	0,0%	5	83,3%	0	0,0%	1	16,7%	6	100,0%
Customer service	2	25,0%	5	62,5%	1	12,5%	0	0,0%	8	100,0%
Other	0	0,0%	14	93,3%	1	6,7%	0	0,0%	15	100,0%
<b>Total</b>	<b>2</b>	<b>1,6%</b>	<b>110</b>	<b>88,0%</b>	<b>10</b>	<b>8,0%</b>	<b>3</b>	<b>2,4%</b>	<b>125</b>	



$p = <0.1\%$  ;  $\chi^2 = 52.77$  ;  $\text{dof} = 18$  (VS)

Dependence is highly significant.

Figure 6.33: Relationships Between SCM and Logistics by Respondent Background

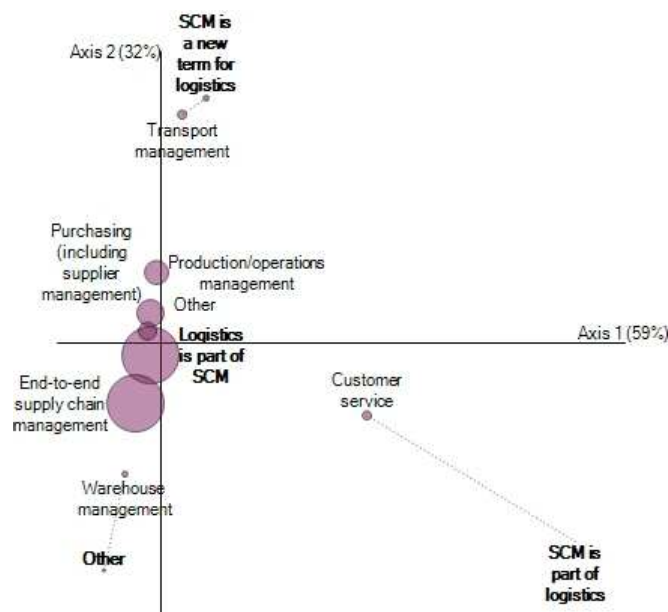


Figure 6.34: Factor Map - Relationships Between SCM and Logistics by Respondent Background

### Language and Terminology Used to Define SCM

As shown earlier in Figure 6.5, a clear majority (57.5%) either “agreed” or “agreed strongly” with the view that the language and terminology used to define SCM



contributes to confusion in understanding, while very few (1.5%) “disagreed strongly”. The data were analysed to test for any differences based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background. In each case the  $\chi^2$  tests suggest that no significant differences exist (NS).

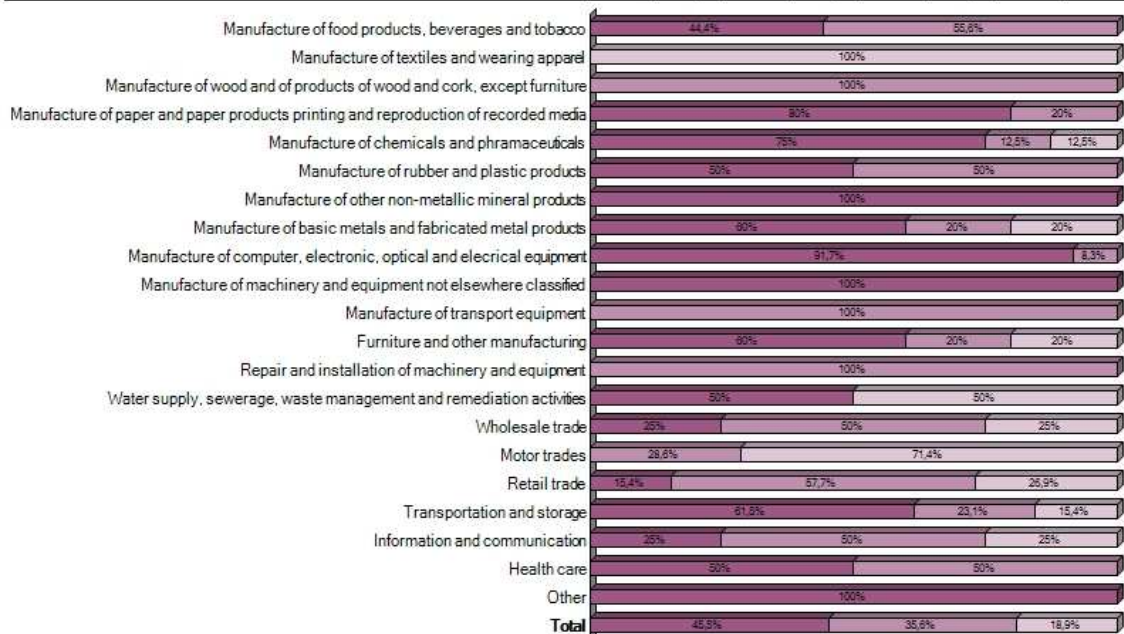
#### Value of Single-Sentence Definitions

Figure 6.6 indicates that more respondents regard single-sentence definitions of value than do not (45.0% compared with 35.9%) but that a significant number (19.1%) have no opinion. The data were analysed to test for any differences based on: (i) sector; (ii) firm size; (iii) firm ownership; and, (iv) respondent background. The  $\chi^2$  tests suggest that highly significant differences exist in each case (VS).

Figure 6.35 shows the data by sector. The high level of significance is largely accounted for by three factors. Firstly, five of the seven respondents (i.e. over 70%) from the motor trades sector indicated “no opinion/don’t know”; this compares with 18.9% across all respondents. Secondly, just four of the 26 respondents (i.e. 15.4%) from the retail trades sector answered in the affirmative; this compares with 45.5% across all respondents. Thirdly, in direct contrast to the retail trades sector all but one respondent (i.e. over 90%) from the “manufacture of computer, optical and electrical equipment” sector answered “yes” compared with the 45% across all respondents.

**6. Many experts have proposed definitions of SCM that use a single sentence. Are such definitions of value?  
In which sector does your company primarily operate?**

	Yes		No		No opinion/don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	4	44,4%	5	55,6%	0	0,0%	9	100,0%
Manufacture of textiles and wearing apparel	0	0,0%	0	0,0%	1	100,0%	1	100,0%
Manufacture of wood and of products of wood and cork, except furniture	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Manufacture of paper and paper products printing and reproduction of recorded media	4	80,0%	1	20,0%	0	0,0%	5	100,0%
Manufacture of chemicals and pharmaceuticals	6	75,0%	1	12,5%	1	12,5%	8	100,0%
Manufacture of rubber and plastic products	1	50,0%	1	50,0%	0	0,0%	2	100,0%
Manufacture of other non-metallic mineral products	2	100,0%	0	0,0%	0	0,0%	2	100,0%
Manufacture of basic metals and fabricated metal products	3	60,0%	1	20,0%	1	20,0%	5	100,0%
Manufacture of computer, electronic, optical and electrical equipment	11	91,7%	1	8,3%	0	0,0%	12	100,0%
Manufacture of machinery and equipment not elsewhere classified	5	100,0%	0	0,0%	0	0,0%	5	100,0%
Manufacture of transport equipment	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Furniture and other manufacturing	3	60,0%	1	20,0%	1	20,0%	5	100,0%
Repair and installation of machinery and equipment	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Water supply, sewerage, waste management and remediation activities	1	50,0%	0	0,0%	1	50,0%	2	100,0%
Wholesale trade	4	25,0%	8	50,0%	4	25,0%	16	100,0%
Motor trades	0	0,0%	2	28,6%	5	71,4%	7	100,0%
Retail trade	4	15,4%	15	57,7%	7	26,9%	26	100,0%
Transportation and storage	8	61,5%	3	23,1%	2	15,4%	13	100,0%
Information and communication	2	25,0%	4	50,0%	2	25,0%	8	100,0%
Health care	1	50,0%	1	50,0%	0	0,0%	2	100,0%
Other	1	100,0%	0	0,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>60</b>	<b>45,5%</b>	<b>47</b>	<b>35,6%</b>	<b>25</b>	<b>18,9%</b>	<b>132</b>	



$p = 0.2\%$  ;  $\chi^2 = 70.39$  ;  $dof = 40$  (VS)

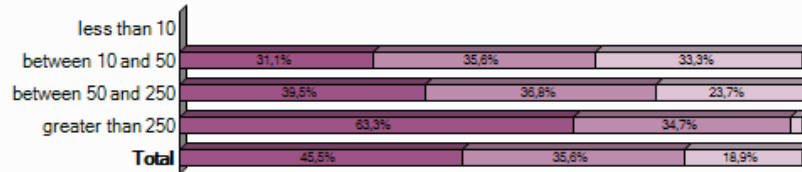
Dependence is highly significant.

Figure 6.35: Value of Single-Sentence Definitions by Sector

Figure 6.36 shows the data by company size based on the number of employees. The high level of significance is mainly accounted for by the “no opinion/don’t know” responses with a high number of small firms and just a single large firm in this category. The relatively large number of large firms that responded “yes” (i.e. 63.3%) is also significant. This can be seen in the factor map of the cross tabulation in Figure 6.37 (below).

6. Many experts have proposed definitions of SCM that use a single sentence. Are such definitions of value? What is your number of full-time equivalent employees in Ireland?

	Yes		No		No opinion/don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0	100,0%
between 10 and 50	14	31,1%	16	35,6%	15	33,3%	45	100,0%
between 50 and 250	15	39,5%	14	36,8%	9	23,7%	38	100,0%
greater than 250	31	63,3%	17	34,7%	1	2,0%	49	100,0%
<b>Total</b>	<b>60</b>	<b>45,5%</b>	<b>47</b>	<b>35,6%</b>	<b>25</b>	<b>18,9%</b>	<b>132</b>	



$p = <0.1\%$  ;  $\chi^2 = 18.55$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.36: Value of Single-Sentence Definitions by Firm Size

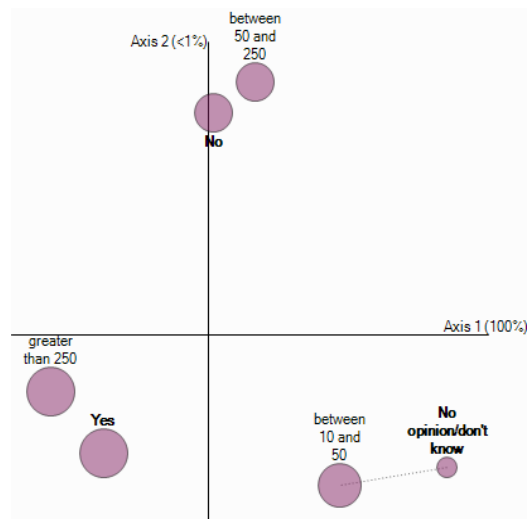
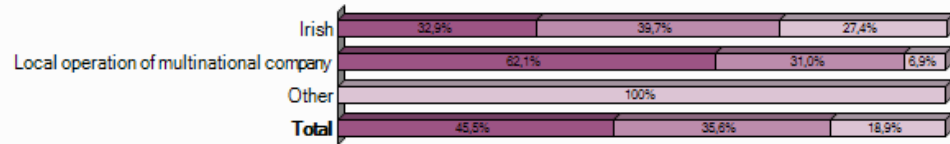


Figure 6.37: Factor Map – Value of Single-Sentence Definitions by Firm Size

Figure 6.38 shows the data by ownership. The high level of significance is due to the relatively high number of indigenous (and “other”) firms (and the proportionately low number of multinationals) answering “no opinion/don’t know”, as well as to the relatively low number of indigenous firms (and the proportionately high number of multinationals) answering “yes”. The factor map in Figure 6.39 again shows this.

**6. Many experts have proposed definitions of SCM that use a single sentence. Are such definitions of value?**  
**What is your company ownership, please tick one:**

	Yes		No		No opinion/don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	24	32.9%	29	39.7%	20	27.4%	73	100.0%
Local operation of multinational company	36	62.1%	18	31.0%	4	6.9%	58	100.0%
Other	0	0.0%	0	0.0%	1	100.0%	1	100.0%
<b>Total</b>	<b>60</b>	<b>45.5%</b>	<b>47</b>	<b>35.6%</b>	<b>25</b>	<b>18.9%</b>	<b>132</b>	



$p = 0.1\%$  ;  $\chi^2 = 18.23$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.38: Value of Single-Sentence Definitions by Firm Ownership

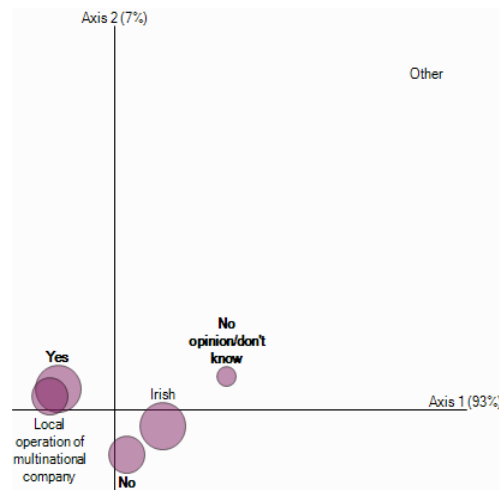
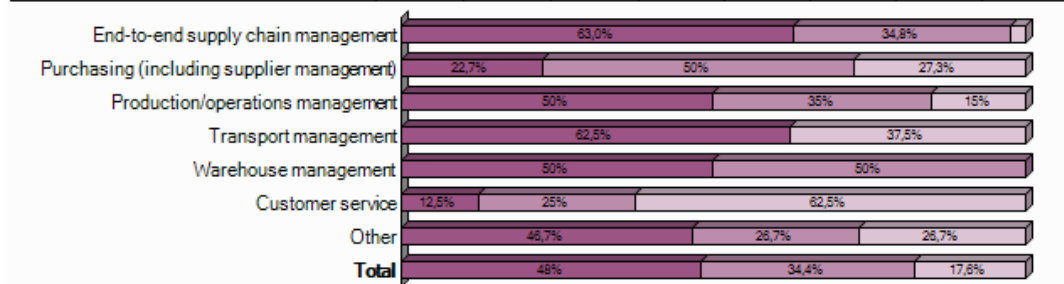


Figure 6.39: Factor Map – Value of Single-Sentence Definitions by Ownership

Finally in relation to the value of single-sentence definitions, Figure 6.40 shows the data by respondent background. As can be seen in the factor map in Figure 6.41, the main contributors to the high significance are the relatively high number of customer service respondents (and the proportionately low number of end-to-end SCM respondents) answering “no opinion/don’t know”. The relatively large number of end-to-end SCM respondents (and the proportionately low number of both purchasing and customer service respondents) answering “yes” is also significant.

**6. Many experts have proposed definitions of SCM that use a single sentence. Are such definitions of value? Which of the following best describes your professional background?**

	Yes		No		No opinion/don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	29	63,0%	16	34,8%	1	2,2%	46	100,0%
Purchasing (including supplier management)	5	22,7%	11	50,0%	6	27,3%	22	100,0%
Production/operations management	10	50,0%	7	35,0%	3	15,0%	20	100,0%
Transport management	5	62,5%	0	0,0%	3	37,5%	8	100,0%
Warehouse management	3	50,0%	3	50,0%	0	0,0%	6	100,0%
Customer service	1	12,5%	2	25,0%	5	62,5%	8	100,0%
Other	7	46,7%	4	26,7%	4	26,7%	15	100,0%
<b>Total</b>	<b>60</b>	<b>48,0%</b>	<b>43</b>	<b>34,4%</b>	<b>22</b>	<b>17,6%</b>	<b>125</b>	



$p = <0.1\%$  ;  $\chi^2 = 32.96$  ;  $dof = 12$  (VS)

Dependence is highly significant.

Figure 6.40: Value of Single-Sentence Definitions by Respondent Background

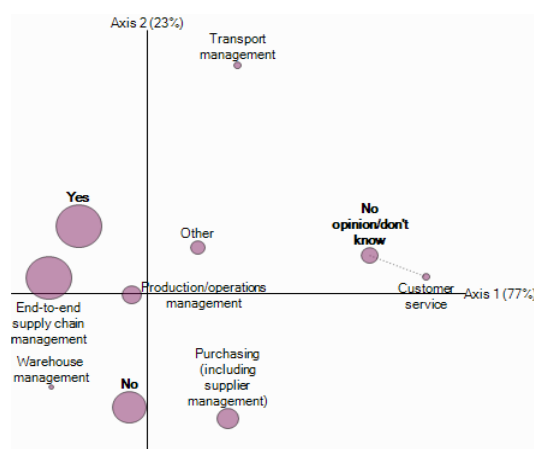


Figure 6.41: Factor Map – Value of Single-Sentence Definitions by Respondent Background

Questionnaire Section 1 (Background): Overall

Table 6.6 summarises the variables tested in section 1 of the questionnaire in relation to sector, firm size, firm ownership and respondent background.

	<b>Sector</b>	<b>Firm Size</b>	<b>Firm Ownership</b>	<b>Respondent Background</b>
<b>Relationship between SCM and Logistics</b>	NS	LS	NS	VS
<b>Language and Terminology Used to Define SCM</b>	NS	NS	NS	NS
<b>Value of Single-Sentence Definitions</b>	VS	VS	VS	VS

Table 6.6: Questionnaire Section 1 – Significance of Dependencies

The highly significant differences across the demographics in relation to the value of single-sentence definitions is somewhat distorted by the large number of “don’t know/no opinion” responses. Nonetheless, the “don’t know/no opinion” responses were more likely in “traditional” (e.g. motor trades) than in “modern” (e.g. electronic, computer, optical and electrical) sectors (as defined by the CSO), and more likely in small indigenous firms than in larger multinationals. In other words, there is a contrast between the relative clarity of responses from the large multinational firms that operate predominantly in the “modern” industries and the ambiguity and/or uncertainty of responses from the smaller indigenous firms that operate mainly in “traditional” sectors.

In terms of defining “supply chain” and “supply chain management”, the prevalence of the word “customer” suggests that a strong customer (or pull) orientation exists with almost two thirds of respondents defining the supply chain as being inter-firm (i.e. external). As noted earlier, there is some evidence that the supply chain is quite narrowly defined and understood in certain sectors (notably the retail and motor trades). There is also appears to be a limited emphasis amongst respondents on the product life cycle orientation to the supply chain despite the prevalence of this concept in the literature in recent years (given – as articulated by Khan and Creazza (2009, p. 301) – “the growing realisation that the supply chain begins on the drawing board”). The “unionist-intersectionist” orientation of the *Four Fundamentals* construct is in line with the majority of definitions provided by respondents. A sizable majority clearly articulates a “unionist” view but with a significant minority specifically noting that logistics is concerned with operational issues associated with the execution of the supply chain (i.e. a largely “intersectionist” perspective).

#### **6.4.2 Questionnaire Section 2: SCM Objectives (Fundamental One)**

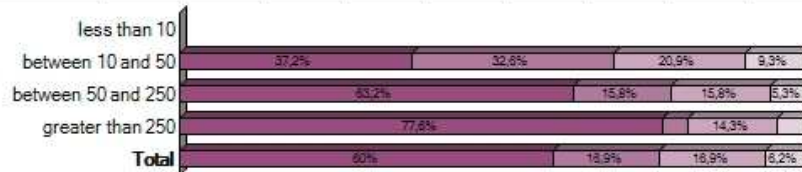
The ten questions in this section relate to SCM objectives – specifically: background, customer service, total supply chain cost and investment, and the service/cost conundrum.

##### Background

In relation to formulation of SCM objectives, the  $\chi^2$  test indicates that no significant differences exist between sectors (NS). However, Figure 6.42 shows that highly significant differences do exist in the area between firms of different sizes (VS). As shown in the factor map in Figure 6.43 this is mainly accounted for by the fact that a large proportion of large and medium-sized firms formulate SCM objectives while a proportionately large number of small firms do not. A similar situation exists in relation to company ownership with the highly significant difference between multinational firms and their indigenous counterparts (VS) suggesting that the former are more likely to formulate such objectives than the latter (see Figure 6.44). Again the factor map in Figure 6.45 shows this very clearly. Figure 6.46 suggests that highly significant differences exist between respondents from different backgrounds (VS). This is mainly accounted for by: (i) a large proportion of end-to-end SCM respondents answering in the affirmative (with none answering “don’t know”); (ii) a large proportion of warehouse management respondents answering “sometimes”; (iii) a large proportion of transport management respondents answering “don’t know”; and, (iv) a relatively large number of purchasing respondents also answering “don’t know”. The factor map in Figure 6.47 shows this.

**7. Does your company formulate specific SCM objectives?**  
**What is your number of full-time equivalent employees in Ireland?**

	Yes		No		Sometimes		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0		0	100,0%
between 10 and 50	16	37,2%	14	32,6%	9	20,9%	4	9,3%	43	100,0%
between 50 and 250	24	63,2%	6	15,8%	6	15,8%	2	5,3%	38	100,0%
greater than 250	38	77,6%	2	4,1%	7	14,3%	2	4,1%	49	100,0%
<b>Total</b>	<b>78</b>	<b>60,0%</b>	<b>22</b>	<b>16,9%</b>	<b>22</b>	<b>16,9%</b>	<b>8</b>	<b>6,2%</b>	<b>130</b>	



$p = 0.4\%$  ;  $\chi^2 = 19.04$  ; dof = 6 (VS)

Dependence is highly significant.

Figure 6.42: Formulation of SCM Objectives by Firm Size

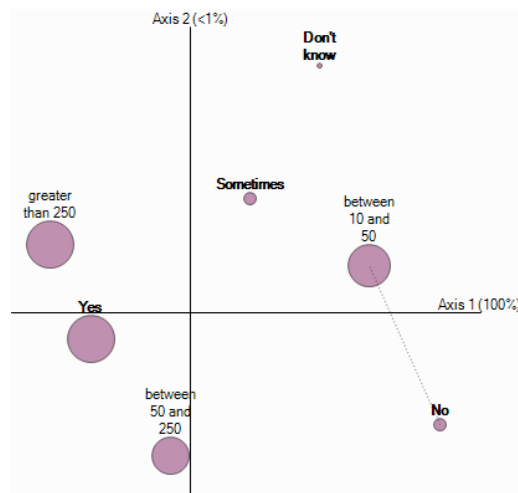
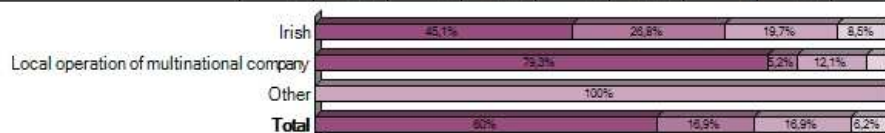


Figure 6.43: Factor Map – Formulation of SCM Objectives by Firm Size

**7. Does your company formulate specific SCM objectives?**  
**What is your company ownership, please tick one:**

	Yes		No		Sometimes		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	32	45,1%	19	26,8%	14	19,7%	6	8,5%	71	100,0%
Local operation of multinational company	46	79,3%	3	5,2%	7	12,1%	2	3,4%	58	100,0%
Other	0	0,0%	0	0,0%	1	100,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>78</b>	<b>60,0%</b>	<b>22</b>	<b>16,9%</b>	<b>22</b>	<b>16,9%</b>	<b>8</b>	<b>6,2%</b>	<b>130</b>	



$p = 0.1\%$  ;  $\chi^2 = 22,38$  ; dof = 6 (VS)

Dependence is highly significant.

Figure 6.44: Formulation of SCM Objectives by Firm Ownership



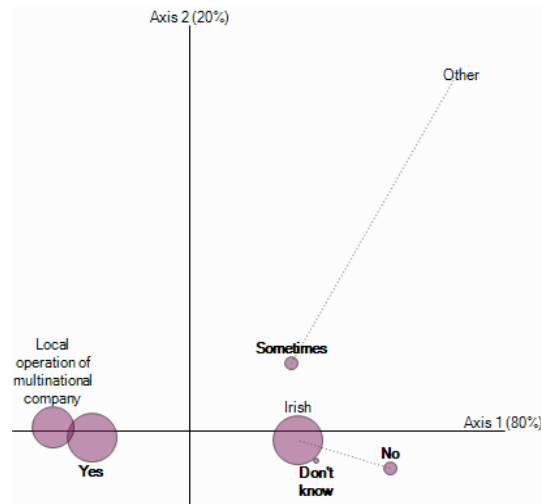
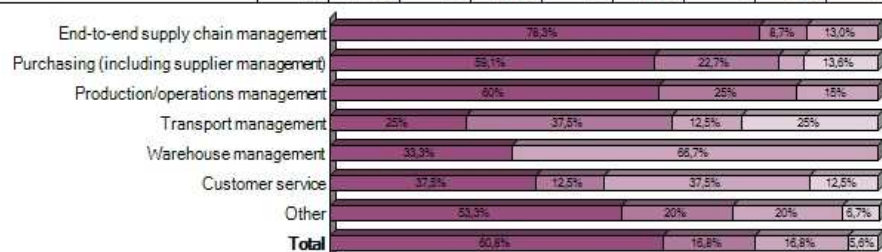


Figure 6.45: Factor Map – Formulation of SCM Objectives by Firm Ownership

**7. Does your company formulate specific SCM objectives?**

Which of the following best describes your professional background?

	Yes		No		Sometimes		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	36	78.3%	4	8.7%	6	13.0%	0	0.0%	46	100.0%
Purchasing (including supplier management)	13	59.1%	5	22.7%	1	4.5%	3	13.6%	22	100.0%
Production/operations management	12	60.0%	5	25.0%	3	15.0%	0	0.0%	20	100.0%
Transport management	2	25.0%	3	37.5%	1	12.5%	2	25.0%	8	100.0%
Warehouse management	2	33.3%	0	0.0%	4	66.7%	0	0.0%	6	100.0%
Customer service	3	37.5%	1	12.5%	3	37.5%	1	12.5%	8	100.0%
Other	8	53.3%	3	20.0%	3	20.0%	1	6.7%	15	100.0%
<b>Total</b>	<b>76</b>	<b>60.8%</b>	<b>21</b>	<b>16.8%</b>	<b>21</b>	<b>16.8%</b>	<b>7</b>	<b>5.6%</b>	<b>125</b>	



$p = 0.4\%$  ;  $\chi^2 = 38.04$  ;  $\text{dof} = 18$  (VS)

Dependence is highly significant.

Figure 6.46: Formulation of SCM Objectives by Respondent Background

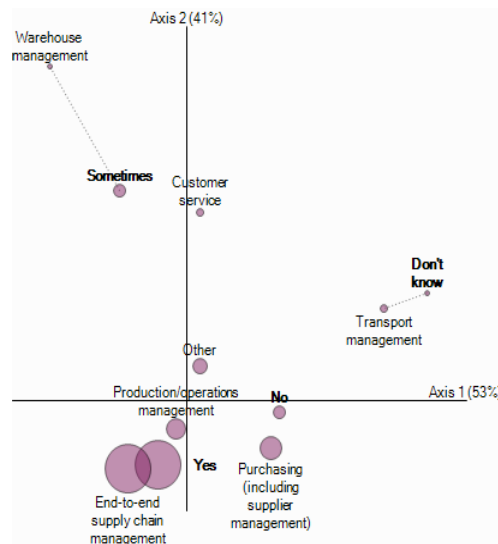


Figure 6.47: Factor Map – Formulation of SCM Objectives by Respondent Background

In terms of the types of SCM objectives formulated by firms, the  $\chi^2$  tests indicate that no significant differences exist by sector, firm size, firm ownership or respondent background (NS). Of the ten respondents who answered “other” some formulate quite narrow SCM objectives (e.g. “raw material costs”) while others made quite general statements such as “supply chain visibility” and “flexibility”.

### Customer Service

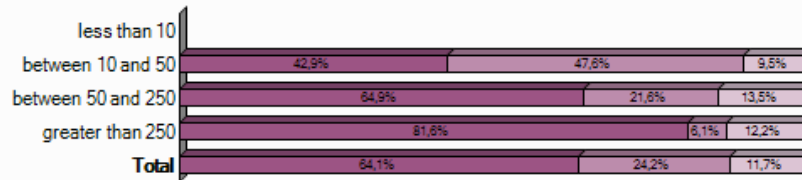
In relation to how respondents rank customer service relative to price and product quality, the  $\chi^2$  tests indicate the no significant differences exist by sector, firm size, firm ownership or respondent background (NS).

The  $\chi^2$  test indicates that no significant differences exist between sectors (NS) in terms of the use of customer service audits. The  $\chi^2$  tests do, however, suggest that significant differences exist based on firm size (VS – see Figure 6.48) and – albeit to a much lesser extent – ownership (LS). The highly significant dependence in the case of firm size is due to the small number of large firms, and the proportionately large number of small firms, answering “no”. The factor map in Figure 6.49 shows this dependence. In the case of firm ownership the slightly significant dependence mirrors the situation regarding firm size with a relatively small number of multinationals, and a proportionately large number of Irish firms, answering “no”. There was no significant difference between respondents from different backgrounds (NS).

**9. Does your company use customer service audits to understand customer expectations and the performance of competitors?**

**What is your number of full-time equivalent employees in Ireland?**

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0	100,0%
between 10 and 50	18	42,9%	20	47,6%	4	9,5%	42	100,0%
between 50 and 250	24	64,9%	8	21,6%	5	13,5%	37	100,0%
greater than 250	40	81,6%	3	6,1%	6	12,2%	49	100,0%
<b>Total</b>	<b>82</b>	<b>64,1%</b>	<b>31</b>	<b>24,2%</b>	<b>15</b>	<b>11,7%</b>	<b>128</b>	



$p = <0.1\%$  ;  $\chi^2 = 21.82$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.48: Use of Customer Service Audits by Firm Size

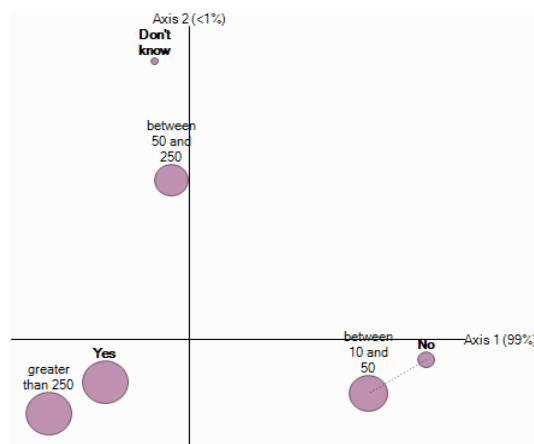


Figure 6.49: Factor Map – Use of Customer Service Audits by Firm Size

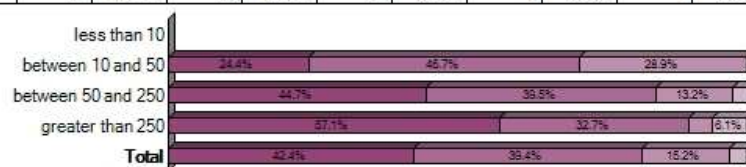
In relation to the elements of customer service that are measured by respondents, the  $\chi^2$  tests indicate that no significant differences exist by sector, firm size, firm ownership or respondent background (NS). Of the ten respondents who answered “other” most indicated that either a wide range of measures (e.g. “a whole range of KPIs”) or industry-specific KPIs (e.g. “specific motor industry metrics”) were used.

In terms of responses by sector to the statement “Understanding customer service sets the specification for SCM/supply chain design”, the  $\chi^2$  test indicates a slightly significant dependence between the variables (LS). The relatively large number of firms from the motor and retail sectors responding “neither agree nor disagree” and the relatively large number of firms in the basic metals and fabricated metals sector

responding “agree strongly”, as well as the fact that half of those responding “disagree” are from the computer, electronic, optical and electrical sector, accounts for this slight dependence. As shown in Figure 6.50 there is a highly significant dependence in relation to firm size (VS). A relatively small number of small firms, and a proportionately large number of large firms, answered “agree strongly”. A relatively large number of small firms, and a proportionately small number of large firms, answered “neither agree nor disagree”. The factor map in Figure 6.51 illustrates this.

**11. Indicate the extent to which you agree/disagree with the following statement:  
Understanding customer service sets the specification for SCM/supply chain design  
What is your number of full-time equivalent employees in Ireland?**

	Agree strongly		Agree		Neither agree nor disagree		Disagree		Disagree strongly		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0		0		0	100.0%
between 10 and 50	11	24.4%	21	46.7%	13	28.9%	0	0.0%	0	0.0%	45	100.0%
between 50 and 250	17	44.7%	15	39.5%	5	13.2%	1	2.6%	0	0.0%	38	100.0%
greater than 250	28	57.1%	16	32.7%	2	4.1%	3	6.1%	0	0.0%	49	100.0%
<b>Total</b>	<b>56</b>	<b>42.4%</b>	<b>52</b>	<b>39.4%</b>	<b>20</b>	<b>15.2%</b>	<b>4</b>	<b>3.0%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



$p = 0.3\%$  ;  $\chi^2 = 19.75$  ;  $\text{dof} = 6$  (VS)

Dependence is highly significant.

Figure 6.50: Role of Customer Service in SCM/Supply Chain Design by Firm Size

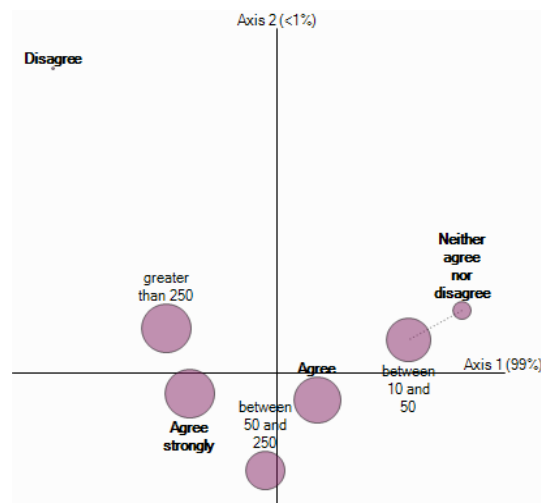


Figure 6.51: Factor Map – the Role of Customer Service in SCM/Supply Chain Design by Firm Size

In relation to the responses based on firm ownership and respondent background, the  $\chi^2$  tests indicate no significance dependences between the variables (NS).

#### Total Supply Chain Cost and Investment

Question 12 asked if “total supply chain cost” was measured by respondents’ firms. Significant differences exist based on sector, firm size, firm ownership and respondent background.

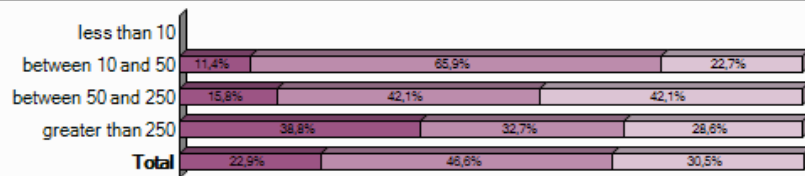
In relation to the situation by sector, the  $\chi^2$  test indicates a slightly significant dependence between the variables (LS). This is mainly accounted for by the relatively large number of respondents from the motor trades sector answering “no” and the relatively large number of respondents from the computer, electronic, optical and electrical sector answering “yes”. Figure 6.52 shows the situation by firm size with the  $\chi^2$  test indicating a highly significant dependence between the variables (VS). As shown in the factor map in Figure 6.53 this is due to the relatively large number of large firms answering in the affirmative, with a large number of small firms answering “no”. Figure 6.54 shows the situation by firm ownership with the  $\chi^2$  test indicating a significant dependence between the variables (S). As shown in the factor map in Figure 6.55 this mirrors the situation with regard to firm size with a relatively large number of multinational firms answering in the affirmative, with a large number of Irish firms answering “no”. Figure 6.56 shows the situation by respondent background with the  $\chi^2$  test indicating a highly significant dependence between the variables (VS). As shown in the factor map in Figure 6.57, this is due to the relatively large number of end-to-end SCM respondents answering “yes” and the relatively large number of transport management respondents answering “don’t know/no opinion”.

Of the 29 respondents that indicated how “total supply chain cost” was measured, the most commonly cited approaches were:

- “landed” cost;
- direct plus indirect costs; and,
- various combinations of discrete cost elements (e.g. “materials cost plus conversion costs plus logistics costs plus inventory costs” and “all costs involved in purchasing, manufacturing, warehousing and transport, as well as forecasting and planning costs, and quality department costs”).

**12. Does your company measure 'total supply chain cost'?**  
**What is your number of full-time equivalent employees in Ireland?**

	Yes		No		Don't know/no opinion		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0	100,0%
between 10 and 50	5	11,4%	29	65,9%	10	22,7%	44	100,0%
between 50 and 250	6	15,8%	16	42,1%	16	42,1%	38	100,0%
greater than 250	19	38,8%	16	32,7%	14	28,6%	49	100,0%
<b>Total</b>	<b>30</b>	<b>22,9%</b>	<b>61</b>	<b>46,6%</b>	<b>40</b>	<b>30,5%</b>	<b>131</b>	



$p = 0.2\%$  ;  $\chi^2 = 17.13$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.52: Measurement of “Total Supply Chain Cost” by Firm Size

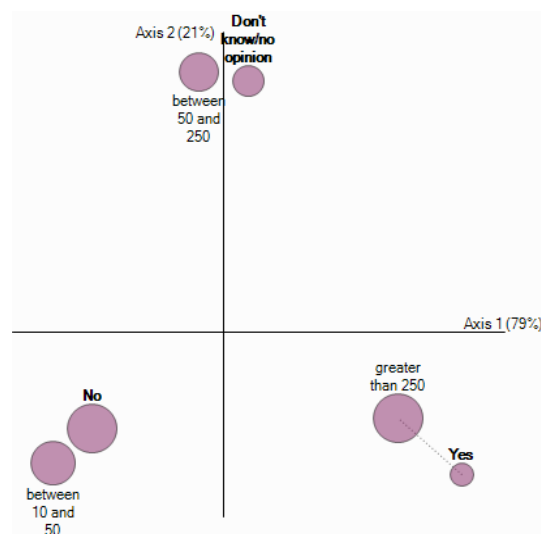
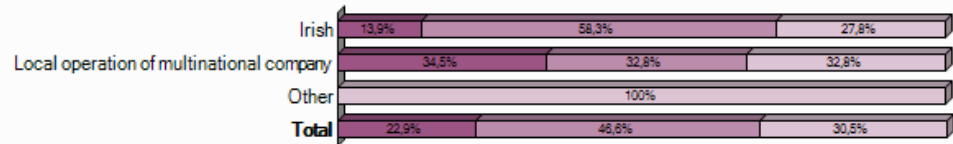


Figure 6.53: Factor Map - Measurement of “Total Supply Chain Cost” by Firm Size

**12. Does your company measure 'total supply chain cost'?**

**What is your company ownership, please tick one:**

	Yes		No		Don't know/no opinion		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	10	13,9%	42	58,3%	20	27,8%	72	100,0%
Local operation of multinational company	20	34,5%	19	32,8%	19	32,8%	58	100,0%
Other	0	0,0%	0	0,0%	1	100,0%	1	100,0%
<b>Total</b>	<b>30</b>	<b>22,9%</b>	<b>61</b>	<b>46,6%</b>	<b>40</b>	<b>30,5%</b>	<b>131</b>	



$p = 1.1\%$  ;  $\chi^2 = 13.01$  ;  $dof = 4$  (S)

Dependence is significant.

Figure 6.54: Measurement of "Total Supply Chain Cost" by Firm Ownership

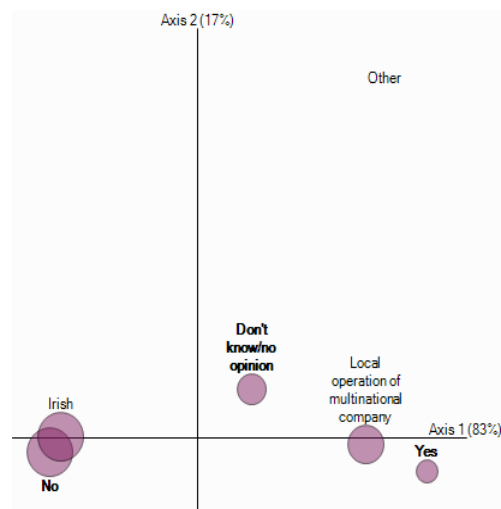
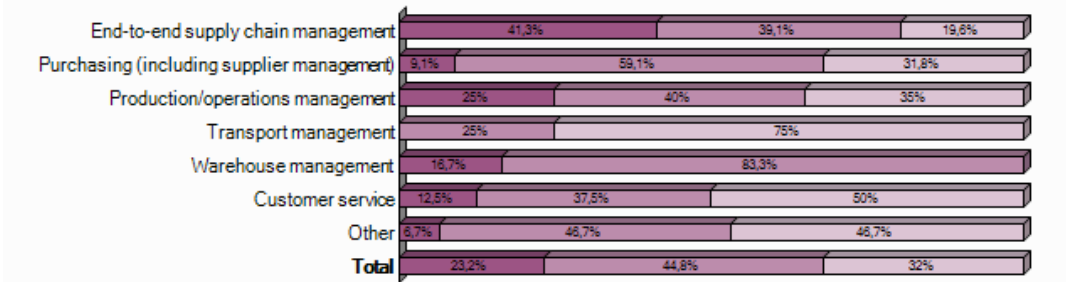


Figure 6.55: Factor Map - Measurement of "Total Supply Chain Cost" by Firm Ownership

**12. Does your company measure 'total supply chain cost'?**  
**Which of the following best describes your professional background?**

	Yes		No		Don't know/no opinion		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	19	41,3%	18	39,1%	9	19,6%	46	100,0%
Purchasing (including supplier management)	2	9,1%	13	59,1%	7	31,8%	22	100,0%
Production/operations management	5	25,0%	8	40,0%	7	35,0%	20	100,0%
Transport management	0	0,0%	2	25,0%	6	75,0%	8	100,0%
Warehouse management	1	16,7%	5	83,3%	0	0,0%	6	100,0%
Customer service	1	12,5%	3	37,5%	4	50,0%	8	100,0%
Other	1	6,7%	7	46,7%	7	46,7%	15	100,0%
<b>Total</b>	<b>29</b>	<b>23,2%</b>	<b>56</b>	<b>44,8%</b>	<b>40</b>	<b>32,0%</b>	<b>125</b>	



$p = 0.7\%$  ;  $\chi^2 = 27.41$  ;  $dof = 12$  (VS)

Dependence is highly significant.

Figure 6.56: Measurement of “Total Supply Chain Cost” by Respondent Background

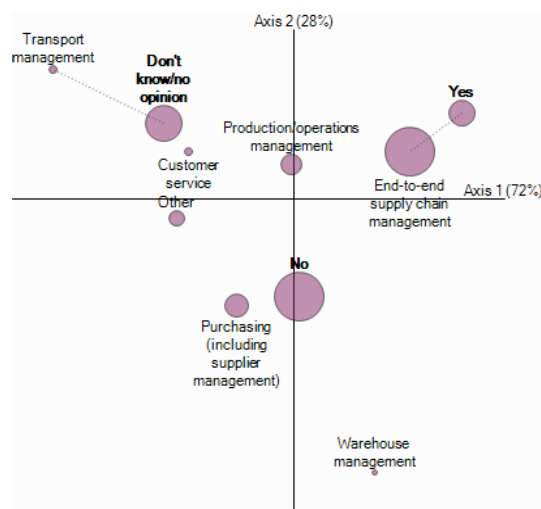


Figure 6.57: Factor Map - Measurement of “Total Supply Chain Cost” by Respondent Background

In relation to costing methodologies used by respondents, the  $\chi^2$  tests indicate that no significant differences exist by sector, firm size, firm ownership or respondent background (NS).



### The Service/Cost Conundrum

Analysis of responses by sector to the statement – “cost/investment optimisation and customer service optimisation are mutually exclusive” – using the  $\chi^2$  test indicates no significant dependence between the variables (NS). Analysis of the responses by firm size shows a slightly significant dependence between the variables (LS). This is a result of the relatively large number of small firms answering “neither agree nor disagree” or “disagree”. Analysis of the responses by firm ownership and respondent background respectively show no significant dependences between the variables (NS).

### Questionnaire Section 2 (Fundamental One): Overall

Table 6.7 summarises the variables tested in section 2 of the questionnaire in relation to sector, firm size, firm ownership and respondent background. Two specific themes emerge from this.

	<b>Sector</b>	<b>Firm Size</b>	<b>Firm Ownership</b>	<b>Respondent Background</b>
<b>Formulation of SCM Objectives</b>	NS	VS	VS	VS
<b>Customer Service Objectives</b>	NS	NS	NS	NS
<b>Customer Service, Price and Product Quality</b>	NS	NS	NS	NS
<b>Use of Customer Service Audits</b>	NS	VS	S	NS
<b>Customer Service Measures</b>	NS	NS	NS	NS
<b>Role of Customer Service in SCM/Supply Chain Design</b>	LS	VS	NS	NS
<b>Measurement of “Total Supply Chain Cost”</b>	LS	VS	S	VS
<b>Costing Methodologies</b>	NS	NS	NS	NS
<b>The Service/Cost Conundrum</b>	NS	LS	NS	NS

Table 6.7: Questionnaire Section 2 – Significance of Dependencies

Firstly, there is evidence of highly significant differences in the approaches adopted by firms based on size and ownership (but not based on sector). In general, smaller indigenous firms lag behind their larger multinational peers. This is the case in relation to the formulation of SCM objectives, the use of customer service audits and the role of customer service in setting the specification for SCM/supply chain design. In line with this observation, there is some evidence to suggest that differences may exist between

“modern” and “traditional” sectors as defined by the CSO. For example, firms in the computer, electronic, optical and electrical sector (“modern”) were more likely to measure “total supply chain cost” than some of their counterparts in the “traditional” sectors (e.g. motor trade). This is not surprising given that many “modern” firms are large multinationals (see section 6.3.7 and Appendix 13). Secondly, there are highly significant differences based on respondent background particularly in relation to the formulation of SCM objectives and the measurement of “total supply chain cost”. In this regard, there is some evidence to suggest a degree of ambiguity in the responses of function-oriented respondents (e.g. transport, warehouse and purchasing managers). This is illustrated by the large number of “don’t know” and “sometimes” answers to question 7 (objectives) and of “don’t know/no opinion” answers to question 12 (supply chain cost). This contrasts with the apparent clarity and certainty that are a feature of the responses of end-to-end supply chain managers (for example, no “don’t know” answers to question 7 and less than 20% “don’t know/no opinion” answers to question 12).

Finally, respondents rank customer service as being more important than price and product quality in the markets that their companies serve across firms in all sectors and irrespective of size or ownership. This evidence supports the author’s contention in section 2.8.2 that customer service is becoming more important than product quality (now largely an order qualifier) and price (largely determined by the dynamics of supply and demand in the market and subject to downward pressure in many sectors) as part of the marketing mix of firms.

#### ***6.4.3 Questionnaire Section 3: Supply Chain Integration (Fundamental Two)***

The six questions in this section relate to background, internal integration, external integration and performance measurement.

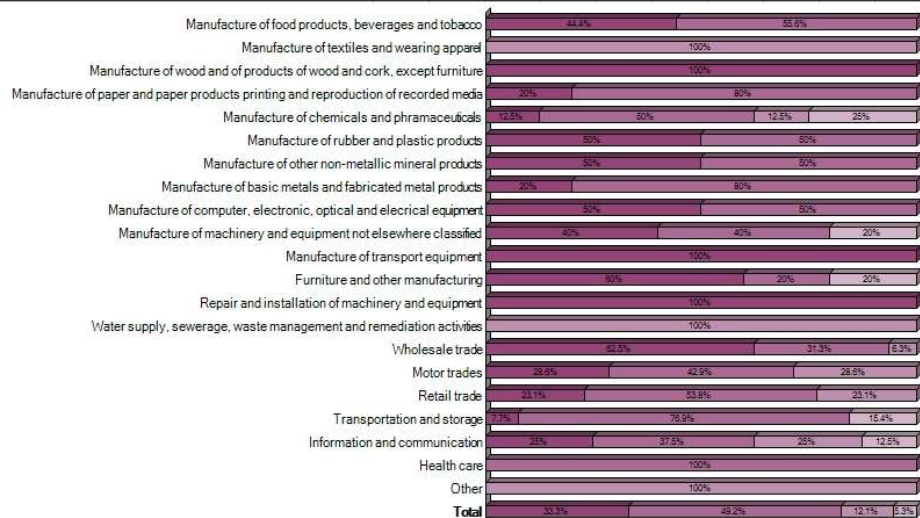
##### **Background**

Figures 6.58 and 6.59 show responses to the statement – SCM is fundamentally concerned with integration of supply chain activities – by sector and firm size, with the  $\chi^2$  tests showing significant differences (S). In the case of sector, this is accounted for by: (i) all firms (albeit just two respondents) in the waste sector answering “neither agree nor disagree”; (ii) a large proportion of firms in the wholesale sector answering “strongly agree”; and, (iii) a relatively large proportion of respondents in the chemical and pharmaceutical sector answering “disagree”. In the case of firm size, the difference

is accounted for by the large number of small firms answering “neither agree nor disagree” as can be clearly seen in the factor map in Figure 6.60. Analysis of this data was carried out by firm ownership and respondent background with the  $\chi^2$  tests indicating no significant dependencies (NS).

15. Indicate the extent to which you agree/disagree with the following statement  
SCM is fundamentally concerned with integration of supply chain activities  
In which sector does your company primarily operate?

	Agree strongly		Agree		Neither agree nor disagree		Disagree		Disagree strongly		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	4	44.4%	5	55.6%	0	0.0%	0	0.0%	0	0.0%	9	100.0%
Manufacture of textiles and wearing apparel	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Manufacture of wood and of products of wood and cork, except furniture	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Manufacture of paper and paper products printing and reproduction of recorded media	1	20.0%	4	80.0%	0	0.0%	0	0.0%	0	0.0%	5	100.0%
Manufacture of chemicals and pharmaceuticals	1	12.5%	4	50.0%	1	12.5%	2	25.0%	0	0.0%	8	100.0%
Manufacture of rubber and plastic products	1	50.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
Manufacture of other non-metallic mineral products	1	50.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
Manufacture of basic metals and fabricated metal products	1	20.0%	4	80.0%	0	0.0%	0	0.0%	0	0.0%	5	100.0%
Manufacture of computer, electronic, optical and electrical equipment	6	50.0%	6	50.0%	0	0.0%	0	0.0%	0	0.0%	12	100.0%
Manufacture of machinery and equipment not elsewhere classified	2	40.0%	2	40.0%	0	0.0%	1	20.0%	0	0.0%	5	100.0%
Manufacture of transport equipment	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Furniture and other manufacturing	3	60.0%	1	20.0%	0	0.0%	1	20.0%	0	0.0%	5	100.0%
Repair and installation of machinery and equipment	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Water supply, sewerage, waste management and remediation activities	0	0.0%	0	0.0%	2	100.0%	0	0.0%	0	0.0%	2	100.0%
Wholesale trade	10	62.5%	5	31.3%	1	6.3%	0	0.0%	0	0.0%	16	100.0%
Motor trades	2	28.6%	3	42.9%	2	28.6%	0	0.0%	0	0.0%	7	100.0%
Retail trade	6	23.1%	14	53.8%	6	23.1%	0	0.0%	0	0.0%	26	100.0%
Transportation and storage	1	7.7%	10	76.9%	0	0.0%	2	15.4%	0	0.0%	13	100.0%
Information and communication	2	25.0%	3	37.5%	2	25.0%	1	12.5%	0	0.0%	8	100.0%
Health care	0	0.0%	2	100.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
Other	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
<b>Total</b>	<b>44</b>	<b>33.3%</b>	<b>65</b>	<b>49.2%</b>	<b>16</b>	<b>12.1%</b>	<b>7</b>	<b>5.3%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



p = 1.6% ; chi2 = 85.91 ; dof = 60 (S)  
Dependence is significant.

Figure 6.58: Role of Integration in SCM by Sector

15. Indicate the extent to which you agree/disagree with the following statement:  
**SCM is fundamentally concerned with integration of supply chain activities**  
 What is your number of full-time equivalent employees in Ireland?

	Agree strongly		Agree		Neither agree nor disagree		Disagree		Disagree strongly		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0		0		0	100.0%
between 10 and 50	9	20.0%	23	51.1%	11	24.4%	2	4.4%	0	0.0%	45	100.0%
between 50 and 250	15	39.5%	19	50.0%	3	7.9%	1	2.6%	0	0.0%	38	100.0%
greater than 250	20	40.8%	23	46.9%	2	4.1%	4	8.2%	0	0.0%	49	100.0%
<b>Total</b>	<b>44</b>	<b>33.3%</b>	<b>65</b>	<b>49.2%</b>	<b>16</b>	<b>12.1%</b>	<b>7</b>	<b>5.3%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



$p = 3.1\%$  ;  $\chi^2 = 13.88$  ;  $dof = 6$  (S)

Dependence is significant.

Figure 6.59: Role of Integration in SCM by Firm Size

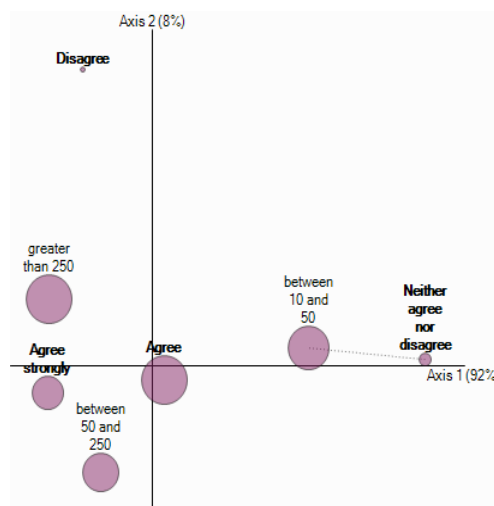


Figure 6.60: Factor Map - Role of Integration in SCM by Firm Size

The other question about background asked respondents to rank the four levels of integration proposed by Fawcett and Magnan (2002). The  $\chi^2$  tests indicate no significant differences by sector, firm size, firm ownership or respondent background (NS).

### Internal Integration

In terms of the extent of internal integration in respondent firms by sector, firm size and respondent background, the  $\chi^2$  tests indicate no significant differences (NS). There is a slightly significant dependency in relation to firm ownership (LS) but this is accounted for by the fact that the only respondent in the “other” category answered “fully integrated”.

### External Integration

In relation to the extent of integration with customers as stated by respondents, the  $\chi^2$  tests indicate no significant differences by sector, firm size, firm ownership or respondent background (NS). In relation to the extent of integration with suppliers as stated by respondents, the  $\chi^2$  tests similarly indicate no significant differences exist by sector, firm size, firm ownership or respondent background (NS).

### Internal and External Integration

As noted in section 3.8.6, the extent to which external integration (i.e. integration with customers and suppliers) is predicated upon internal integration is also of interest. Table 6.8 shows that the correlation coefficient is 0.39 when a regression model is created using the data about integration with customers (y) and internal integration (x) suggesting no significant dependency. The equivalent correlation coefficient for integration with suppliers (y) and internal integration (x) is higher at 0.47 suggesting a slightly significant dependency (LS).

<u>Variables</u>	<u>Correlation and Regression Analysis</u>
<b>y: integration with customers</b> <b>x: internal integration</b>	$r = +0.39$ (NS) $y = 0.41x + 1.76$ Dependence is not significant. Evaluation of scale modalities: from 1 (Fully integrated) to 5 (Not at all integrated)
<b>y: integration with suppliers</b> <b>x: internal integration</b>	$r = +0.47$ (LS) $y = 0.52x + 1.35$ Dependence is slightly significant. Evaluation of scale modalities: from 1 (Fully integrated) to 5 (Not at all integrated)

Table 6.8: Internal and External Integration

An analysis of the relationship between respondents' rankings of the various types of SCI (based on the Fawcett and Magnan (2002) taxonomy) and the three different types of integration addressed by the survey (i.e. internal, with customers and with suppliers) revealed no significant dependences in all cases (NS).

### Performance Measurement

A wide range of KPIs are in use in respondents' firms. The most commonly mentioned service-related metrics were on-shelf availability (OSA) and out-of-stocks (OOS), as well as a variety of time-based measures (e.g. order-to-cash cycle times). Stock turns and/or inventory turnover ratio was mentioned by a number of respondents. In addition,

a number of respondents cited quite specific metrics or measurement methodologies (e.g. SCOR, QUOTIF (quality, on-time and in-full), the “perfect order”, the balanced scorecard and “the Miles (2010) hierarchy”).

#### Questionnaire Section 3 (*Fundamental Two*): Overall

Overall, the great majority of respondents believe that SCM is fundamentally concerned with integration of supply chain activities. Furthermore, Table 6.9 reveals that there are few significant differences between different types and sizes of firms. Indifference in a relatively large proportion of small firms in relation to the role of integration in SCM again suggests a degree of uncertainty on the part of respondents in relation to this issue. It is interesting that a relatively high proportion of purchasing (i.e. supplier-facing) respondents regarded their firms as “highly integrated” with suppliers, while quite a high proportion of production/operations respondents answered “poorly integrated” in this regard. This suggests that the role that respondents play in the supply chain has an influence on their perceptions of the extent of integration. It is also interesting to note that there is little evidence to support the view that external integration is predicated on the extent of internal integration, and that there are no significant differences between firms of different types and sizes in relation to the importance attributed to different levels of integration.

	<b>Sector</b>	<b>Firm Size</b>	<b>Firm Ownership</b>	<b>Respondent Background</b>
<b>Role of Integration</b>	S	S	NS	NS
<b>Importance of</b>	NS	NS	NS	NS
<b>Different Types of SCI</b>				
<b>Extent of Internal</b>	NS	NS	LS	NS
<b>Integration</b>				
<b>Extent of Integration</b>	NS	NS	NS	NS
<b>with Customers</b>				
<b>Extent of Integration</b>	NS	NS	NS	NS
<b>with Suppliers</b>				

Table 6.9: Questionnaire Section 3 – Significance of Dependencies

#### **6.4.4 Questionnaire Section 4: Supply Chain Flow Management (*Fundamental Three*)**

The questions in this section relate to material, money and information flows, including the use of ICT in respondents’ firms.

## Material Flows

Figure 6.61 shows management of material flows by sector with the  $\chi^2$  test showing a highly significant difference across sectors (VS). This is due to the relatively large proportion of firms in the “machinery and equipment not classified elsewhere” answering “adequately managed” and those in the wholesale sector answering “very well managed”. Analysis of management of material flows by firm size, ownership and respondent background was carried out with the  $\chi^2$  tests indicating no significant dependencies (NS).

21. How would you describe the manner in which your company's supply chain material flows are managed?  
In which sector does your company primarily operate?

	Very well managed		Well managed		Adequately managed		Poorly managed		Very poorly managed		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	2	22.2%	5	55.6%	2	22.2%	0	0.0%	0	0.0%	9	100.0%
Manufacture of textiles and wearing apparel	0	0.0%	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Manufacture of wood and of products of wood and cork, except furniture	0	0.0%	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Manufacture of paper and paper products printing and reproduction of recorded media	0	0.0%	2	40.0%	3	60.0%	0	0.0%	0	0.0%	5	100.0%
Manufacture of chemicals and pharmaceuticals	1	12.5%	4	50.0%	2	25.0%	1	12.5%	0	0.0%	8	100.0%
Manufacture of rubber and plastic products	0	0.0%	0	0.0%	2	100.0%	0	0.0%	0	0.0%	2	100.0%
Manufacture of other non-metallic mineral products	0	0.0%	2	100.0%	0	0.0%	0	0.0%	0	0.0%	2	100.0%
Manufacture of basic metals and fabricated metal products	0	0.0%	2	40.0%	1	20.0%	2	40.0%	0	0.0%	5	100.0%
Manufacture of computer, electronic, optical and electrical equipment	1	8.3%	8	66.7%	3	25.0%	0	0.0%	0	0.0%	12	100.0%
Manufacture of machinery and equipment not elsewhere classified	0	0.0%	1	20.0%	4	80.0%	0	0.0%	0	0.0%	5	100.0%
Manufacture of transport equipment	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Furniture and other manufacturing	0	0.0%	3	60.0%	1	20.0%	1	20.0%	0	0.0%	5	100.0%
Repair and installation of machinery and equipment	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Water supply, sewerage, waste management and remediation activities	0	0.0%	1	50.0%	1	50.0%	0	0.0%	0	0.0%	2	100.0%
Wholesale trade	4	25.0%	9	56.3%	3	18.8%	0	0.0%	0	0.0%	16	100.0%
Motor trades	0	0.0%	4	57.1%	3	42.9%	0	0.0%	0	0.0%	7	100.0%
Retail trade	1	3.8%	15	57.7%	10	38.5%	0	0.0%	0	0.0%	26	100.0%
Transportation and storage	2	15.4%	7	53.8%	3	23.1%	1	7.7%	0	0.0%	13	100.0%
Information and communication	1	12.5%	5	62.5%	2	25.0%	0	0.0%	0	0.0%	8	100.0%
Health care	0	0.0%	1	50.0%	0	0.0%	1	50.0%	0	0.0%	2	100.0%
Other	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
<b>Total</b>	<b>14</b>	<b>10.6%</b>	<b>71</b>	<b>53.8%</b>	<b>40</b>	<b>30.3%</b>	<b>7</b>	<b>5.3%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



p = 0.8% ; chi2 = 89.58 ; dof = 60 (VS)

Dependence is highly significant.

Figure 6.61: Management of Material Flows by Sector

### Financial Flows

In relation to financial flows by sector, the  $\chi^2$  test shows that dependence is slightly significant (LS). The large number of transportation and storage firms answering “very well managed” largely accounts for this. Analysis of the management of financial flows by firm size was carried out with the  $\chi^2$  test indicating that no significant differences exist (NS). In relation to management of financial flows by firm ownership and respondent background the  $\chi^2$  test indicates that the dependence is slightly significant (LS).

### Information Flows

In relation to the manner in which supply chain information flows are managed as stated by respondents, the  $\chi^2$  tests indicate that no significant differences exist by sector, firm size, firm ownership or respondent background (NS).

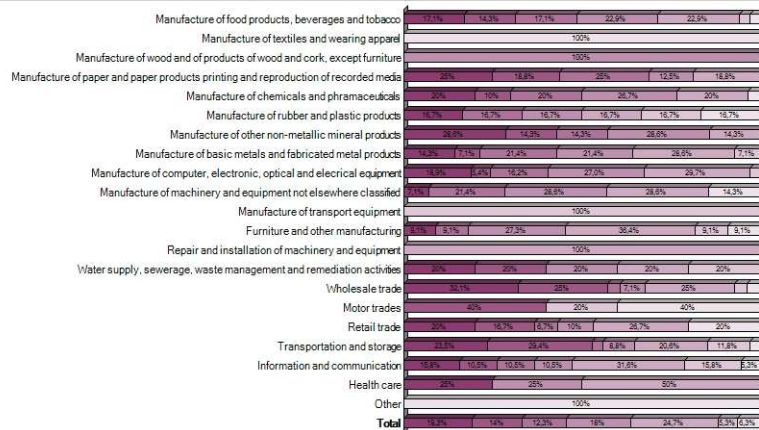
### ICT Tools

The final question in this section asked about the ICT tools used in respondents’ firms. Figure 6.62 shows this data by sector with the  $\chi^2$  test indicating that dependence is significant (S). Apart from the relatively large proportion of respondents in a number of sectors who answered “other”, this is largely accounted for by the large proportion of firms in the transport and warehousing sector that use transport management systems, as well as the relatively large number of information and communications firms that used extended enterprise systems. Figure 6.63 shows the data by firm size with the  $\chi^2$  test indicating that dependence is highly significant (VS). As shown in the factor map in Figure 6.64, a high proportion of small firms use transport management systems and a high proportion of medium-sized firms use enterprise solutions, with large firms using a range of solution types.



24. Which of the following ICT tools does your company use? Tick all that are used.  
In which sector does your company primarily operate?

	Warehouse management systems		Transport management systems		Manufacturing planning systems		MRP		Enterprise solutions (ERP)		Extended enterprise systems		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	6	17.1%	5	14.3%	6	17.1%	8	22.9%	8	22.9%	1	2.9%	1	2.9%	35	100.0%
Manufacture of textiles and wearing apparel	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	1	100.0%
Manufacture of wood and of products of wood and cork, except furniture	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
Manufacture of paper and paper products printing and reproduction of recorded media	4	25.0%	3	18.8%	4	25.0%	2	12.5%	3	18.8%	0	0.0%	0	0.0%	16	100.0%
Manufacture of chemicals and pharmaceuticals	6	20.0%	3	10.0%	6	20.0%	8	26.7%	6	20.0%	0	0.0%	1	3.3%	30	100.0%
Manufacture of rubber and plastic products	1	16.7%	0	0.0%	1	16.7%	1	16.7%	1	16.7%	1	16.7%	1	16.7%	6	100.0%
Manufacture of other non-metallic mineral products	2	28.6%	1	14.3%	1	14.3%	2	28.6%	1	14.3%	0	0.0%	0	0.0%	7	100.0%
Manufacture of basic metals and fabricated metal products	2	14.3%	1	7.1%	3	21.4%	3	21.4%	4	28.6%	1	7.1%	0	0.0%	14	100.0%
Manufacture of computer, electronic, optical and electrical equipment	7	18.9%	2	5.4%	6	16.2%	10	27.0%	11	29.7%	1	2.7%	0	0.0%	37	100.0%
Manufacture of machinery and equipment not elsewhere classified	1	7.1%	0	0.0%	3	21.4%	4	28.6%	4	28.6%	0	0.0%	2	14.3%	14	100.0%
Manufacture of transport equipment	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	1	100.0%
Furniture and other manufacturing	1	9.1%	0	0.0%	1	9.1%	3	27.3%	4	36.4%	1	9.1%	1	9.1%	11	100.0%
Repair and installation of machinery and equipment	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%	0	0.0%	1	100.0%
Water supply, sewerage, waste management and remediation activities	1	20.0%	1	20.0%	0	0.0%	1	20.0%	1	20.0%	1	20.0%	0	0.0%	5	100.0%
Wholesale trade	9	32.1%	7	25.0%	1	3.6%	2	7.1%	7	25.0%	1	3.6%	1	3.6%	28	100.0%
Motor trades	0	0.0%	2	40.0%	0	0.0%	0	0.0%	0	0.0%	1	20.0%	2	40.0%	5	100.0%
Retail trade	6	20.0%	5	16.7%	2	6.7%	3	10.0%	8	26.7%	0	0.0%	6	20.0%	30	100.0%
Transportation and storage	8	23.5%	10	29.4%	1	2.9%	3	8.8%	7	20.6%	4	11.8%	1	2.9%	34	100.0%
Information and communication	3	15.8%	2	10.5%	2	10.5%	2	10.5%	6	31.6%	3	15.8%	1	5.3%	19	100.0%
Health care	1	25.0%	0	0.0%	0	0.0%	1	25.0%	2	50.0%	0	0.0%	0	0.0%	4	100.0%
Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	1	100.0%
<b>Total</b>	<b>58</b>	<b>19.3%</b>	<b>42</b>	<b>14.0%</b>	<b>37</b>	<b>12.3%</b>	<b>54</b>	<b>18.0%</b>	<b>74</b>	<b>24.7%</b>	<b>16</b>	<b>5.3%</b>	<b>19</b>	<b>6.3%</b>	<b>300</b>	



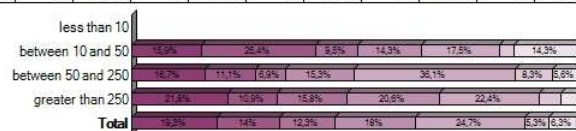
$p = 1.3\%$  ;  $\chi^2 = 157.06$  ;  $\text{dof} = 120$  (S)

Dependence is significant.

Figure 6.62: Use of ICT Tools by Sector

24. Which of the following ICT tools does your company use? Tick all that are used.  
What is your number of full-time equivalent employees in Ireland?

	Warehouse management systems		Transport management systems		Manufacturing planning systems		MRP		Enterprise solutions (ERP)		Extended enterprise systems		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	100.0%
between 10 and 50	10	15.9%	16	25.4%	6	9.5%	9	14.3%	11	17.5%	2	3.2%	9	14.3%	63	100.0%
between 50 and 250	12	16.7%	8	11.1%	5	6.9%	11	15.3%	26	36.1%	6	8.3%	4	5.6%	72	100.0%
greater than 250	36	21.8%	18	10.9%	26	15.8%	34	20.6%	37	22.4%	8	4.8%	6	3.6%	165	100.0%
<b>Total</b>	<b>58</b>	<b>19.3%</b>	<b>42</b>	<b>14.0%</b>	<b>37</b>	<b>12.3%</b>	<b>54</b>	<b>18.0%</b>	<b>74</b>	<b>24.7%</b>	<b>16</b>	<b>5.3%</b>	<b>19</b>	<b>6.3%</b>	<b>300</b>	



$p = 0.4\%$  ;  $\chi^2 = 29.23$  ;  $\text{dof} = 12$  (VS)

Dependence is highly significant.

Figure 6.63: Use of ICT Tools by Firm Size

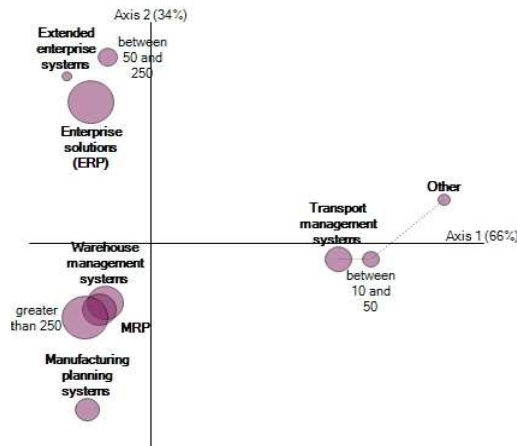


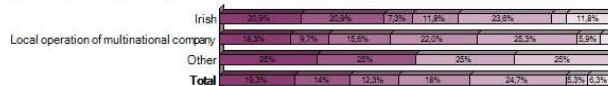
Figure 6.64: Factor Map - Use of ICT Tools by Firm Size

Figure 6.65 shows use of ICT tools by ownership with the  $\chi^2$  test showing that dependence is highly significant (VS). The use of transport management systems by a relatively large number of Irish firms (and the proportionately low level of usage of these systems by multinationals), as well as the limited use of manufacturing planning and MRP systems by Irish firms, contribute to this high level of significance. A large number of Irish firms also answered “other”. Closer analysis of the 19 respondents who elaborated on this reveals that most tools in this category are stock control/inventory management systems, as well as other bespoke point solutions. A graphical representation of this is shown in the factor map in Figure 6.66.

Finally in relation to ICT tools, the  $\chi^2$  test reveals that dependence is not significant in relation to respondent background (NS).

24. Which of the following ICT tools does your company use? Tick all that are used.  
What is your company ownership, please tick one:

	Warehouse management systems		Transport management systems		Manufacturing planning systems		MRP		Enterprise solutions (ERP)		Extended enterprise systems		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	23	20.9%	23	20.9%	8	7.3%	13	11.8%	26	23.6%	4	3.6%	13	11.8%	110	100.0%
Local operation of multinational company	34	18.3%	18	9.7%	29	15.6%	41	22.0%	47	25.3%	11	5.9%	6	3.2%	186	100.0%
Other	1	25.0%	1	25.0%	0	0.0%	0	0.0%	1	25.0%	1	25.0%	0	0.0%	4	100.0%
<b>Total</b>	<b>58</b>	<b>19.3%</b>	<b>42</b>	<b>14.0%</b>	<b>37</b>	<b>12.3%</b>	<b>54</b>	<b>18.0%</b>	<b>74</b>	<b>24.7%</b>	<b>16</b>	<b>5.3%</b>	<b>19</b>	<b>6.3%</b>	<b>300</b>	



p = 0.5% ; chi2 = 28.02 ; dof = 12 (VS)

Dependence is highly significant.

Figure 6.65: Use of ICT Tools by Firm Ownership

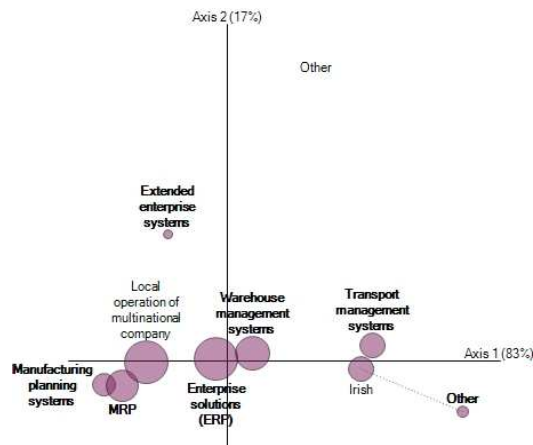


Figure 6.66: Factor Map - Use of ICT Tools by Firm Ownership

### Information Flows and Material/Financial Flows

As noted in section 3.8.6, it was argued in Chapter 2 that the effective management of material and money flows is predicated upon the effective management of the related information flows. This can be tested using the data from the questions in this section of the questionnaire.

Variables	Correlation and Regression Analysis
<b>y: material flow management</b> <b>x: information flow management</b>	$r = +0.55$ (LS) $y = 0.65x + 0.98$ Dependence is slightly significant. Evaluation of scale modalities: from 1 (Very well managed) to 5 (Very poorly managed)
<b>y: financial flow management</b> <b>x: information flow management</b>	$r = +0.42$ (LS) $y = 0.42x + 1.47$ Dependence is slightly significant. Evaluation of scale modalities: from 1 (Very well managed) to 5 (Very poorly managed)

Table 6.10: Dependence of Material and Financial Flows on Information Flows

Table 6.10 shows that the correlation coefficient is 0.55 when a regression model is created using the data about material flow management (y) and information flow management (x) suggesting a slightly significant dependency (LS). The equivalent correlation coefficient for financial flow management (y) and information flow management (x) is 0.42 again suggesting a slightly significant dependency (LS).

### ICT Tools Used and Management of Information Flows

Interestingly, there is also a slightly significant dependency between the ICT tools used by firms and the manner in which information flows are managed (LS).

#### Questionnaire Section 4 (*Fundamental Three*): Overall

Table 6.11 summarises the variables tested in section 4 of the questionnaire in relation to sector, firm size, firm ownership and respondent background.

	Sector	Firm Size	Firm Ownership	Respondent Background
<b>Material Flows</b>	S	NS	NS	NS
<b>Financial Flows</b>	LS	NS	LS	LS
<b>Information Flows</b>	NS	NS	NS	NS
<b>ICT Tools</b>	S	VS	VS	NS

Table 6.11: Questionnaire Section 4 – Significance of Dependencies

A few key points emerge from this as follows:

- Material and financial flows are “very well managed” in the wholesale, and transportation and storage, sectors respectively;
- There is further evidence of divergence between Irish and multinational firms in relation to management of financial flows;
- End-to-end supply chain respondents are more likely to assert that financial and material flows are “well managed” or “very well managed” – this again suggests that the role that respondents play in the supply chain has an influence on their perceptions;
- Firm ownership and size influences the types of ICT deployed with, for example, large firms using a range of solution types; and,
- Sector plays an important role in terms of the types of ICT used to support supply chain planning and execution with, for example, transport management systems – not surprisingly – widely used by firms in the transport and storage sector.

#### **6.4.5 Questionnaire Section 5: Supply Chain Relationships (*Fundamental Four*)**

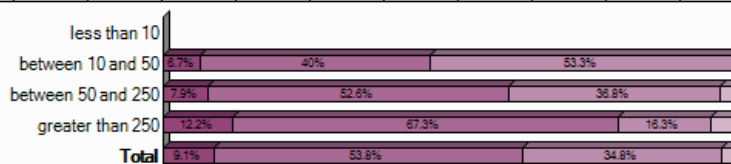
The three questions in this section assessed the strength of internal relationships, as well as those with upstream customers and downstream suppliers.

In relation to the strength of internal relationships by firm size, the  $\chi^2$  test indicates a slightly significant dependence (LS). More detailed analysis did not reveal anything of particular interest. Analysis of the strength of internal relationships by firm size, ownership and respondent background was also carried out, with the  $\chi^2$  tests indicating no significant dependences (NS).

In terms of the strength of relationships with upstream (i.e. customer) companies by sector, the  $\chi^2$  test indicates the dependence is not significant (NS). Figure 6.67 shows the data by firm size with the  $\chi^2$  test suggesting that the dependence is significant (S). This is mainly due to the relatively large number of small firms – and the proportionately small number of large firms – answering “neither strong nor weak” (see factor map in Figure 6.68). Figure 6.69 shows the data by firm ownership with the  $\chi^2$  test suggesting that the dependence is highly significant (VS). As shown in factor map in Figure 6.70, multinationals are much more likely to have relationships with customers that are characterised as “very strong”. Analysis of the data by respondent background suggests that the dependence is slightly significant (LS). Further analysis – including a factor map – did not reveal anything of particular interest.

**26. How would you describe the nature and extent of relationships with upstream (i.e. customer) companies?  
What is your number of full-time equivalent employees in Ireland?**

	Very strong		Strong		Neither strong nor weak		Weak		Very Weak		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0		0		0	100.0%
between 10 and 50	3	6.7%	18	40.0%	24	53.3%	0	0.0%	0	0.0%	45	100.0%
between 50 and 250	3	7.9%	20	52.6%	14	36.8%	1	2.6%	0	0.0%	38	100.0%
greater than 250	6	12.2%	33	67.3%	8	16.3%	2	4.1%	0	0.0%	49	100.0%
<b>Total</b>	<b>12</b>	<b>9.1%</b>	<b>71</b>	<b>53.8%</b>	<b>46</b>	<b>34.8%</b>	<b>3</b>	<b>2.3%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



$p = 1.9\%$  ;  $\chi^2 = 15.19$  ;  $\text{dof} = 6$  (S)

Dependence is significant.

Figure 6.67: Relationships with Customers by Firm Size

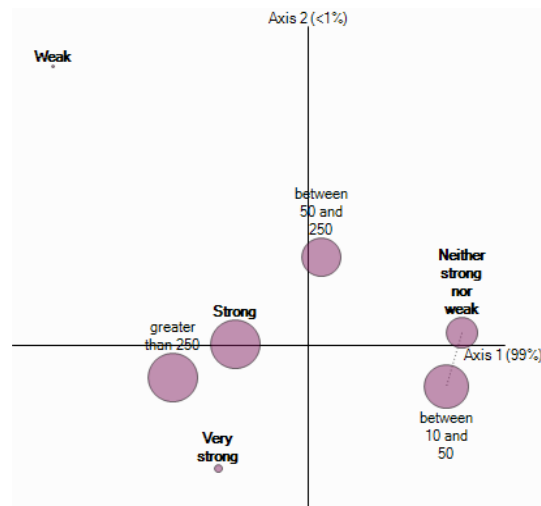
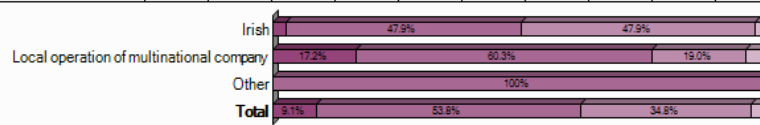


Figure 6.68: Factor Map - Relationships with Customers by Firm Size

26. How would you describe the nature and extent of relationships with upstream (i.e. customer) companies?

What is your company ownership, please tick one:

	Very strong		Strong		Neither strong nor weak		Weak		Very Weak		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	2	2.7%	35	47.9%	35	47.9%	1	1.4%	0	0.0%	73	100.0%
Local operation of multinational company	10	17.2%	35	60.3%	11	19.0%	2	3.4%	0	0.0%	58	100.0%
Other	0	0.0%	1	100.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%
<b>Total</b>	<b>12</b>	<b>9.1%</b>	<b>71</b>	<b>53.8%</b>	<b>46</b>	<b>34.8%</b>	<b>3</b>	<b>2.3%</b>	<b>0</b>	<b>0.0%</b>	<b>132</b>	



$p = 0.7\%$  ;  $\chi^2 = 17.67$  ;  $dof = 6$  (VS)

Dependence is highly significant.

Figure 6.69: Relationships with Customers by Firm Ownership

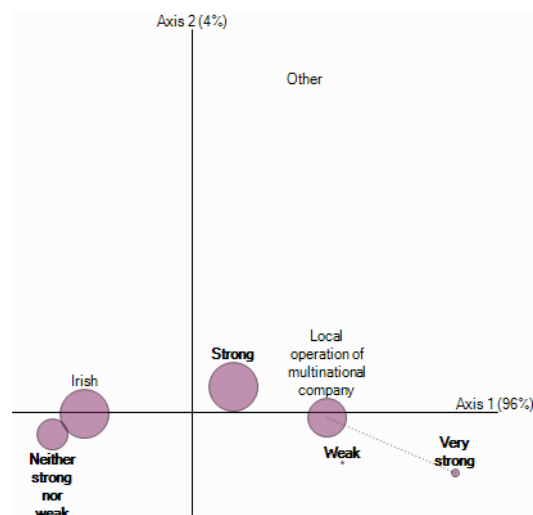


Figure 6.70: Factor Map - Relationships with Customers by Firm Ownership

Turning to relationships with downstream (i.e. supplier) companies,  $\chi^2$  tests on these data indicate that no significant dependences exist by sector, firm size, ownership or respondent background (NS).

### Internal and External Relationships

As noted in section 3.8.6, the extent to which external relationships (i.e. relationships with customers and suppliers) are predicated upon internal relationships is also of interest. Table 6.12 shows that the correlation coefficient is 0.36 when a regression model is created using the data about relationships with customers (y) and internal relationships (x) suggesting no significant dependency (NS). The equivalent correlation coefficient for relationships with suppliers (y) and internal relationships (x) is higher at 0.40 suggesting a slightly significant dependency (LS).

<b>Variables</b>	<b>Correlation and Regression Analysis</b>
<b>y: relationships with customers</b> <b>x: internal relationships</b>	$r = +0.36$ (NS) $y = 0.41x + 1.37$ Dependence is not significant. Evaluation of scale modalities: from 1 (Very strong) to 5 (Very weak)
<b>y: relationships with supplier</b> <b>x: internal relationships</b>	$r = +0.40$ (LS) $y = 0.38x + 1.44$ Dependence is slightly significant. Evaluation of scale modalities: from 1 (Very strong) to 5 (Very weak)

Table 6.12: Internal and External Relationships

### Questionnaire Section 5 (Fundamental Four): Overall

Table 6.13 summarises the variables tested in section 4 of the questionnaire in relation to sector, firm size, firm ownership and respondent background. The data suggests that large multinational firms are more likely than their smaller indigenous counterparts to have strong relationships with their customers. As with integration (see section 6.4.3 above), it is interesting that purchasing (i.e. supplier-facing) respondents were most likely to characterise supplier relationships as “strong” or “very strong”, with production/operations respondents more likely to characterise them as “weak”. This again suggests that the role that respondents play in the supply chain has an influence on their perceptions of the strength of relationships with suppliers.

	<b>Sector</b>	<b>Firm Size</b>	<b>Firm Ownership</b>	<b>Respondent Background</b>
<b>Internal Relationships</b>	LS	NS	NS	NS
<b>Relationships with Customers</b>	NS	S	VS	LS
<b>Relationships with Suppliers</b>	NS	NS	NS	NS

Table 6.13: Questionnaire Section 5 – Significance of Dependencies

It was noted in section 6.4.3 (above) that there is little evidence to support the view that external integration is predicated on the extent of internal integration. Similarly, there is little evidence to suggest that the strength of external relationships is predicated on that of internal relationships.

#### ***6.4.6 Questionnaire Section 6: Supply Chain Improvement***

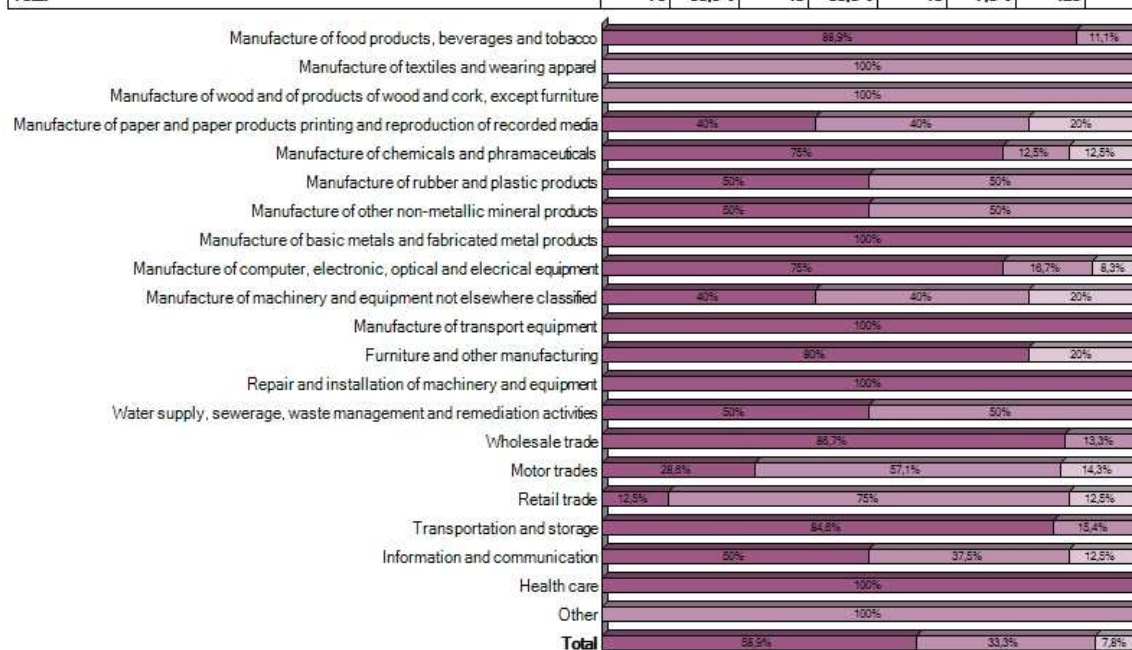
Figure 6.71 shows the respondents whose firms have implemented any major supply chain improvement initiatives in the last two years by sector. The  $\chi^2$  test indicates that dependence is significant (S). This is largely as a result of the large proportion of firms in the motor trades sector that have not implemented any such initiative.

Figure 6.72 shows the data by firm size with the  $\chi^2$  test indicates that dependence is highly significant (VS). The factor map in Figure 6.73 shows that this high level of significance is due to the large number of large firms that have implemented such initiatives and the large number of small firms that have not. Analysis of the data by firm ownership (see Figure 6.74) reveals a similar pattern with the  $\chi^2$  test again indicating that dependence is highly significant (VS). Irish firms are much more likely not to have implemented a major improvement initiative than their multinational counterparts (see factor map in Figure 6.75). Analysis of the data by respondent background (see Figure 6.76) also reveals a significant dependence with end-to-end SCM respondents most likely to reply in the affirmative. This, combined with the relatively high number of respondents in some other categories who answered “don’t know”, suggests that such individuals are more likely to be aware of major improvement initiatives that, by definition, are likely to involve an “end-to-end” approach.



**28. Has your company implemented any major supply chain improvement initiatives in the last two years?  
In which sector does your company primarily operate?**

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	8	88,9%	1	11,1%	0	0,0%	9	100,0%
Manufacture of textiles and wearing apparel	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Manufacture of wood and of products of wood and cork, except furniture	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Manufacture of paper and paper products printing and reproduction of recorded media	2	40,0%	2	40,0%	1	20,0%	5	100,0%
Manufacture of chemicals and pharmaceuticals	6	75,0%	1	12,5%	1	12,5%	8	100,0%
Manufacture of rubber and plastic products	1	50,0%	1	50,0%	0	0,0%	2	100,0%
Manufacture of other non-metallic mineral products	1	50,0%	1	50,0%	0	0,0%	2	100,0%
Manufacture of basic metals and fabricated metal products	5	100,0%	0	0,0%	0	0,0%	5	100,0%
Manufacture of computer, electronic, optical and electrical equipment	9	75,0%	2	16,7%	1	8,3%	12	100,0%
Manufacture of machinery and equipment not elsewhere classified	2	40,0%	2	40,0%	1	20,0%	5	100,0%
Manufacture of transport equipment	1	100,0%	0	0,0%	0	0,0%	1	100,0%
Furniture and other manufacturing	4	80,0%	0	0,0%	1	20,0%	5	100,0%
Repair and installation of machinery and equipment	1	100,0%	0	0,0%	0	0,0%	1	100,0%
Water supply, sewerage, waste management and remediation activities	1	50,0%	1	50,0%	0	0,0%	2	100,0%
Wholesale trade	13	86,7%	2	13,3%	0	0,0%	15	100,0%
Motor trades	2	28,6%	4	57,1%	1	14,3%	7	100,0%
Retail trade	3	12,5%	18	75,0%	3	12,5%	24	100,0%
Transportation and storage	11	84,6%	2	15,4%	0	0,0%	13	100,0%
Information and communication	4	50,0%	3	37,5%	1	12,5%	8	100,0%
Health care	2	100,0%	0	0,0%	0	0,0%	2	100,0%
Other	0	0,0%	1	100,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>76</b>	<b>58,9%</b>	<b>43</b>	<b>33,3%</b>	<b>10</b>	<b>7,8%</b>	<b>129</b>	



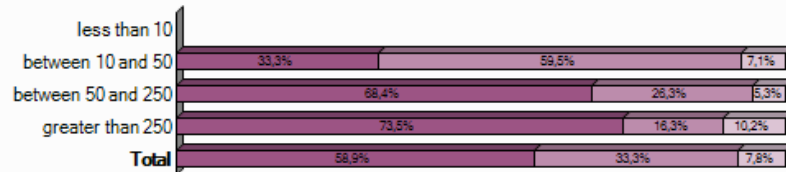
$p = 2.6\%$  ;  $\chi^2 = 59.24$  ;  $\text{dof} = 40$  (**S**)

Dependence is significant.

Figure 6.71: Supply Chain Improvement Initiatives in the Last Two Years by Sector

28. Has your company implemented any major supply chain improvement initiatives in the last two years?  
What is your number of full-time equivalent employees in Ireland?

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0	100,0%
between 10 and 50	14	33,3%	25	59,5%	3	7,1%	42	100,0%
between 50 and 250	26	68,4%	10	26,3%	2	5,3%	38	100,0%
greater than 250	36	73,5%	8	16,3%	5	10,2%	49	100,0%
<b>Total</b>	<b>76</b>	<b>58,9%</b>	<b>43</b>	<b>33,3%</b>	<b>10</b>	<b>7,8%</b>	<b>129</b>	



$p = <0.1\%$  ;  $\chi^2 = 21.17$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.72: Supply Chain Improvement Initiatives in the Last Two Years by Firm Size

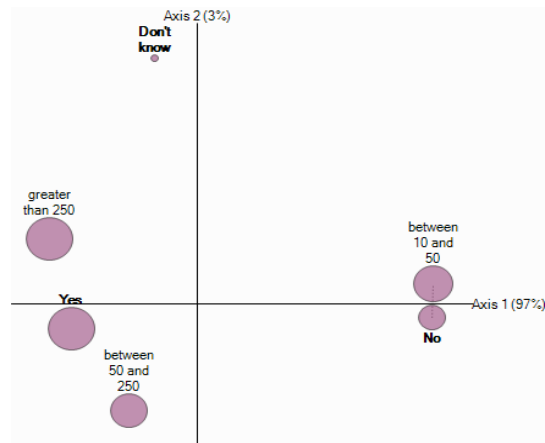
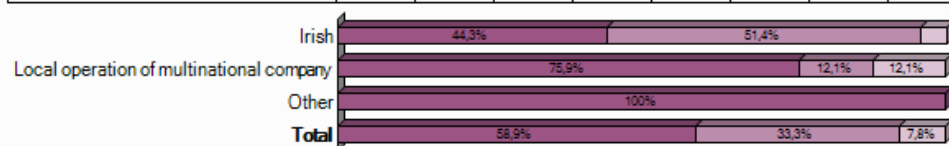


Figure 6.73: Factor Map - Supply Chain Improvement Initiatives in the Last Two Years by Firm Size

28. Has your company implemented any major supply chain improvement initiatives in the last two years?  
What is your company ownership, please tick one:

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	31	44,3%	36	51,4%	3	4,3%	70	100,0%
Local operation of multinational company	44	75,9%	7	12,1%	7	12,1%	58	100,0%
Other	1	100,0%	0	0,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>76</b>	<b>58,9%</b>	<b>43</b>	<b>33,3%</b>	<b>10</b>	<b>7,8%</b>	<b>129</b>	



$p = <0.1\%$  ;  $\chi^2 = 23.29$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.74: Supply Chain Improvement Initiatives in the Last Two Years by Firm Ownership

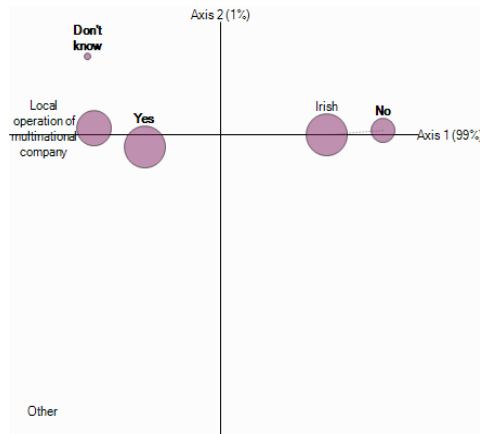
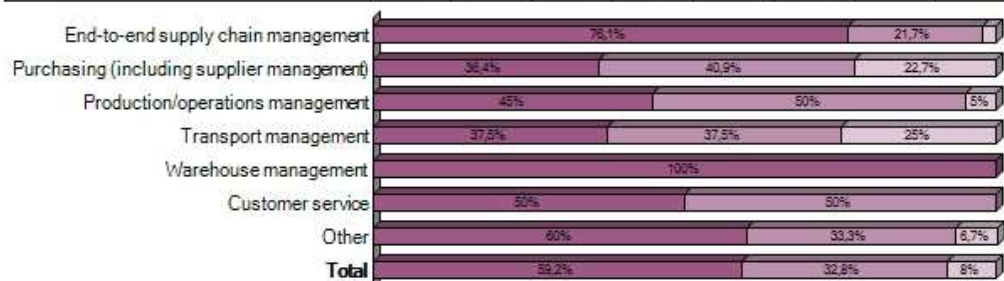


Figure 6.75: Factor Map - Supply Chain Improvement Initiatives in the Last Two Years by Firm Ownership

28. Has your company implemented any major supply chain improvement initiatives in the last two years?  
Which of the following best describes your professional background?

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	35	76,1%	10	21,7%	1	2,2%	46	100,0%
Purchasing (including supplier management)	8	36,4%	9	40,9%	5	22,7%	22	100,0%
Production/operations management	9	45,0%	10	50,0%	1	5,0%	20	100,0%
Transport management	3	37,5%	3	37,5%	2	25,0%	8	100,0%
Warehouse management	6	100,0%	0	0,0%	0	0,0%	6	100,0%
Customer service	4	50,0%	4	50,0%	0	0,0%	8	100,0%
Other	9	60,0%	5	33,3%	1	6,7%	15	100,0%
<b>Total</b>	<b>74</b>	<b>59,2%</b>	<b>41</b>	<b>32,8%</b>	<b>10</b>	<b>8,0%</b>	<b>125</b>	



$p = 1.0\%$  ;  $\chi^2 = 26.16$  ;  $dof = 12 (S)$

Dependence is significant.

Figure 6.76: Supply Chain Improvement Initiatives in the Last Two Years by Respondent Background

From the 70 usable responses provided by participants, Figure 6.77 shows the types of supply chain improvement initiatives that have been implemented in respondents' firms in the last two years.

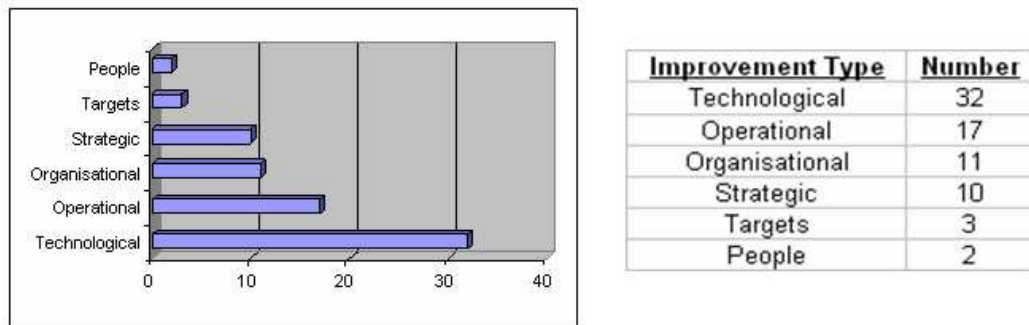


Figure 6.77: Types of Improvement Initiatives Implemented in the Last Two Years

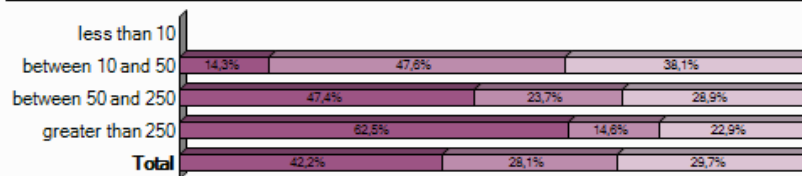
The most common response referred to investment in technology of some kind. For example, one response stated “implementation of ERP system linked to customers and suppliers”. Many responses had a primarily operational focus, often with a menu of options set out. Several responses in this category specifically alluded to the implementation of lean thinking in firms’ operations. Many respondents referred to improvements that were primarily organisational in nature. Such responses often mentioned changes to the architecture of the supply chain and the outsourcing of functionality. One respondent, for example, spoke of “consolidation of shipments via one logistics provider”. Some responses were more strategic than operational in focus, typically mentioning the need for an end-to-end or supply chain wide approach. One such response referred to a “complete review of the supply chain”. Other respondents did no more than state targets that had been achieved (e.g. “33% reduction in stock holding”), while a small number had a specific focus on human resource issues and the people dimension (e.g. “improved cross-functional communications”). Some responses fell into more than a single category.

Turning to improvements planned for the next two years, analysis of the data by sector suggests a slightly significant dependence (LS). More detailed analysis indicates a relatively large number of firms in the food products, beverages and tobacco sector – and small numbers in the retail and motor trades sectors – answering “yes”. Figure 6.78 shows the data by firm size with the  $\chi^2$  test suggesting a highly significant dependence (VS). This mirrors the situation with regard to improvements initiated in the last two years with major initiatives much more likely to have been planned in large firms than in small ones. This is clearly shown in the factor map in Figure 6.79. A similar situation can be seen when the data is analysed by firm ownership (see Figure 6.80) with the  $\chi^2$  test again suggesting a highly significant dependence (VS). A large number of Irish firms – and a proportionately small number of multinationals – indicated that no major

initiative was planned. This can again be quite clearly seen in the factor map in Figure 6.81. Finally, and as with improvements initiated in the last two years, the data shows significant differences based on respondent background (see Figure 6.82). A relatively large proportion of end-to-end SCM respondents answered in the affirmative, with relatively high numbers of respondents in some other categories again answering “don’t know”.

**29. Does your company plan to implement any major supply chain improvement initiatives in the next two years?  
What is your number of full-time equivalent employees in Ireland?**

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0	100,0%
between 10 and 50	6	14,3%	20	47,6%	16	38,1%	42	100,0%
between 50 and 250	18	47,4%	9	23,7%	11	28,9%	38	100,0%
greater than 250	30	62,5%	7	14,6%	11	22,9%	48	100,0%
<b>Total</b>	<b>54</b>	<b>42,2%</b>	<b>36</b>	<b>28,1%</b>	<b>38</b>	<b>29,7%</b>	<b>128</b>	



$p = <0.1\%$  ;  $\chi^2 = 23.51$  ;  $\text{dof} = 4$  (VS)

Dependence is highly significant.

Figure 6.78: Supply Chain Improvement Initiatives in the Next Two Years by Firm Size

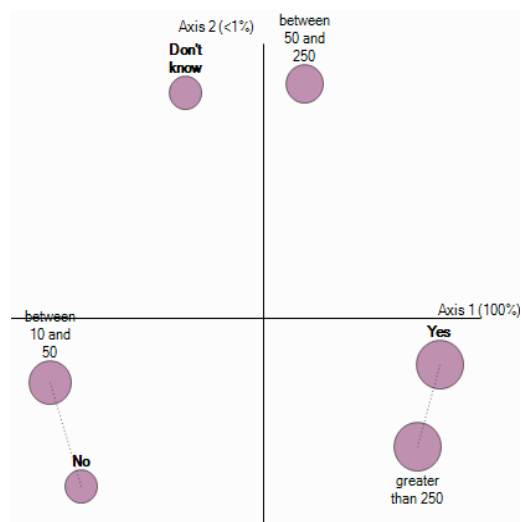
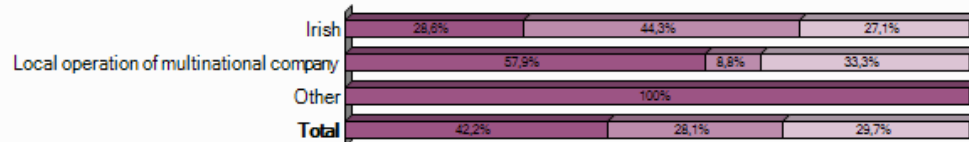


Figure 6.79: Factor Map - Supply Chain Improvement Initiatives in the Next Two Years by Firm Size

29. Does your company plan to implement any major supply chain improvement initiatives in the next two years?  
What is your company ownership, please tick one:

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	20	28,6%	31	44,3%	19	27,1%	70	100,0%
Local operation of multinational company	33	57,9%	5	8,8%	19	33,3%	57	100,0%
Other	1	100,0%	0	0,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>54</b>	<b>42,2%</b>	<b>36</b>	<b>28,1%</b>	<b>38</b>	<b>29,7%</b>	<b>128</b>	



$p = <0.1\%$  ;  $\chi^2 = 22.28$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 6.80: Supply Chain Improvement Initiatives in the Next Two Years by Firm Ownership

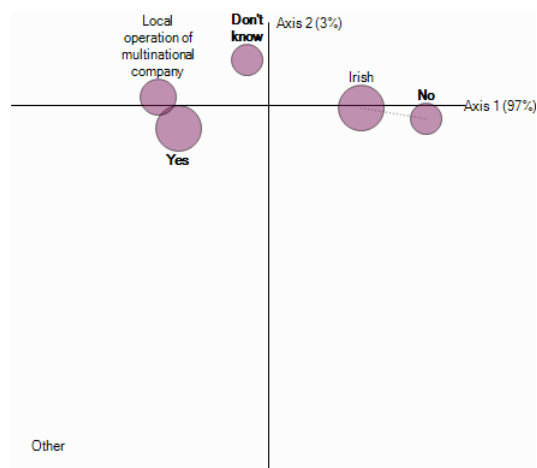
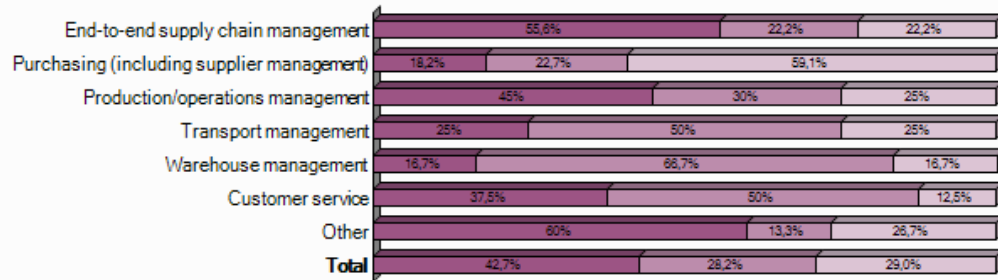


Figure 6.81: Factor Map - Supply Chain Improvement Initiatives in the Next Two Years by Firm Ownership

**29. Does your company plan to implement any major supply chain improvement initiatives in the next two years?  
Which of the following best describes your professional background?**

	Yes		No		Don't know		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.
End-to-end supply chain management	25	55,6%	10	22,2%	10	22,2%	45	100,0%
Purchasing (including supplier management)	4	18,2%	5	22,7%	13	59,1%	22	100,0%
Production/operations management	9	45,0%	6	30,0%	5	25,0%	20	100,0%
Transport management	2	25,0%	4	50,0%	2	25,0%	8	100,0%
Warehouse management	1	16,7%	4	66,7%	1	16,7%	6	100,0%
Customer service	3	37,5%	4	50,0%	1	12,5%	8	100,0%
Other	9	60,0%	2	13,3%	4	26,7%	15	100,0%
<b>Total</b>	<b>53</b>	<b>42,7%</b>	<b>35</b>	<b>28,2%</b>	<b>36</b>	<b>29,0%</b>	<b>124</b>	



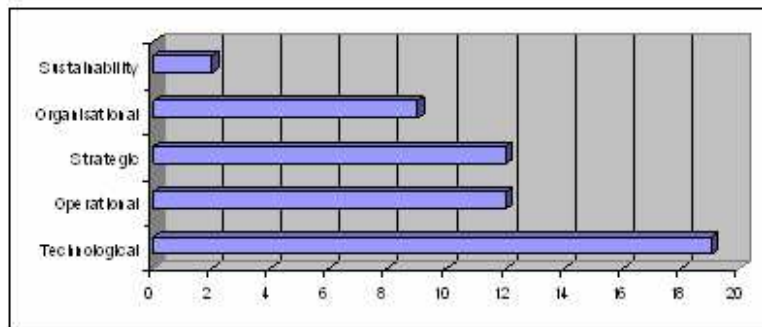
$p = 1.9\%$  ;  $\chi^2 = 24.16$  ;  $dof = 12$  (S)

Dependence is significant.

Figure 6.82: Supply Chain Improvement Initiatives in the Next Two Years by Respondent Background

From the 48 usable responses provided by participants, Figure 6.83 shows the types of supply chain improvement initiatives planned in respondents' firms in the next two years. The examples illustrate the nature of typical planned improvements. As with initiatives undertaken in the last two years, technology-oriented improvements are most common. There is evidence of a stronger focus on strategic chain-wide improvements in future planning than in earlier initiatives. Initiatives aimed at operational and organisational improvement are again common. Two firms in the sample cited initiatives aimed specifically at generating improvements in environmental sustainability. Some responses fell into more than a single category.



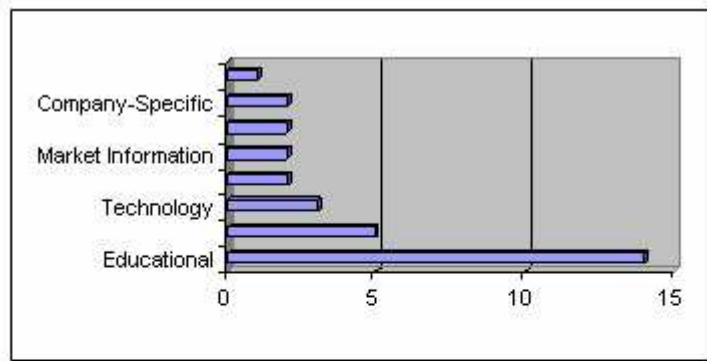


Improvement Type	Number	Examples
Technological	19	Retail point-of-sale systems; voice technology
Operational	12	Margin to serve capability; enhanced planning techniques
Strategic	12	Complete re-engineering of all SC activities
Organisational	9	Review distribution partners across European subsidiaries
Sustainability	2	Invest in energy efficient refrigeration systems

Figure 6.83: Types of Improvement Initiatives Planned in the Next Two Years

Finally, respondents were asked about policy initiatives that could be adopted to facilitate wider adoption of SCM. Figure 6.84 shows a breakdown of the 28 usable responses received. The most common response related to education and training with several respondents suggesting that support be provided for such initiatives. Several respondents referred to the need for greater recognition of the role of SCM particularly at a senior level in organisations. Various possible initiatives were cited that had technological and environmental foci. Two respondents felt that support could be provided in relation to information about the “dynamics of the market place”. Two respondents made reference to the notion of Ireland being a global SCM hub, while two others referred to possible company-specific initiatives. Some responses fell into more than a single category.





Policy Initiative	Number	Examples
Educational	14	Financial support for SCM education/training
Recognition	5	Greater awareness of holistic SCM at boardroom level
Technology	3	Market intelligence engine to develop and deploy SCM
Environment	2	Support for environmental schemes (e.g. scrappage)
Market Information	2	Approved European vendor list
SCM "Hub"	2	Ireland should position itself as a hub of SCM excellence
Company-Specific	2	Keep product as adaptable as possible for all geographies
Other	1	Updates pricing protocol to reduce disputes

Figure 6.84: Possible Policy Initiatives

#### Questionnaire Section 6 (Supply Chain Improvement): Overall

Table 6.14 summarises the variables tested in section 6 of the questionnaire in relation to sector, firm size, firm ownership and respondent background. Again a strong theme here is that the larger multinationals are more likely than smaller indigenous firms to have implemented major supply chain improvement initiatives. This appears to be particularly true in certain CSO-defined “traditional” sectors (e.g. motor trades). A similar picture emerges in relation to planned improvements. As noted above, end-to-end supply chain respondents are more likely than their functional counterparts to be aware of recently implemented or planned improvement initiatives. Given the supply chain wide nature of “major” initiatives, it seems reasonable to surmise that these individuals are more likely to be involved in such improvement projects. Finally, it is interesting to note that the majority of implemented and planned improvement initiatives are characterised as either technological or operational (i.e. rather than people-related or strategic).

	Sector	Firm Size	Firm Ownership	Respondent Background
<b>Recent Improvement Initiatives</b>	S	VS	VS	S
<b>Planned Improvement Initiatives</b>	LS	VS	VS	S

Table 6.14: Questionnaire Section 6 – Significance of Dependencies

#### 6.4.7 Relationships Across Sections

The foregoing focussed on relationships between variables within each section of the questionnaire. This section extends that focus to explore relationships between variables across different sections – *cross-sectional analysis*. As noted in section 3.8.6, three issues are of particular interest in this context:

1. the relationship between different types of SCI and the manner in which information flows are managed (given the concept that integration is predicated upon effective information management);
2. the relationship between different types of SCI and the use of ICT tools (given the role often attributed to ICT as an enabler of SCI); and,
3. relationships between different types of SCI and the strength of different types of relationships.

#### SCI and Information Flows

Figure 6.85 shows the data for the extent of internal SCI and the manner in which information flows are managed. The  $\chi^2$  test suggests that the dependence is highly significant (VS).

23. How would you describe the the manner in which your company's supply chain information flows are managed?  
 17. How would you describe the extent to which your company's internal supply chain activities are integrated?

	Very well managed		Well managed		Adequately managed		Poorly managed		Very poorly managed		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Fully integrated	5	45,5%	6	54,5%	0	0,0%	0	0,0%	0	0,0%	11	100,0%
Highly integrated	10	22,2%	22	48,9%	12	26,7%	0	0,0%	1	2,2%	45	100,0%
Somewhat integrated	1	1,5%	22	33,3%	36	54,5%	7	10,6%	0	0,0%	66	100,0%
Poorly integrated	0	0,0%	0	0,0%	5	55,6%	3	33,3%	1	11,1%	9	100,0%
Not at all integrated	0		0		0		0		0		0	100,0%
<b>Total</b>	<b>16</b>	<b>12,2%</b>	<b>50</b>	<b>38,2%</b>	<b>53</b>	<b>40,5%</b>	<b>10</b>	<b>7,6%</b>	<b>2</b>	<b>1,5%</b>	<b>131</b>	



$p = <0.1\%$  ;  $\chi^2 = 56.76$  ;  $\text{dof} = 12$  (VS)

Dependence is highly significant.

Figure 6.85: Internal Integration and Information Flow Management

The factor map in Figure 6.86 shows a clear link between supply chains that are “poorly integrated”, and “poorly managed” or “very poorly managed” information flows. The corollary of this is that supply chains that are “fully” or “highly” integrated tend to be those where information flows are “well managed” or “very well managed”.

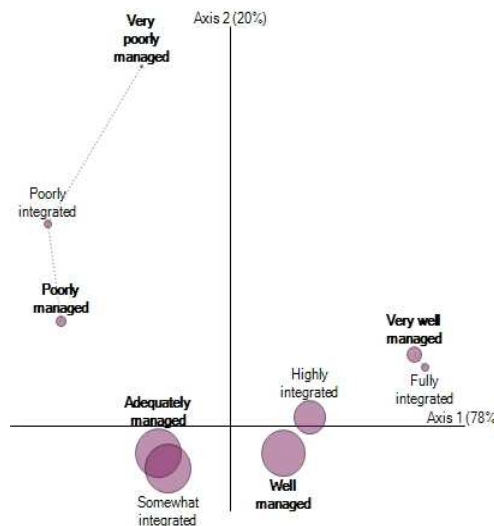
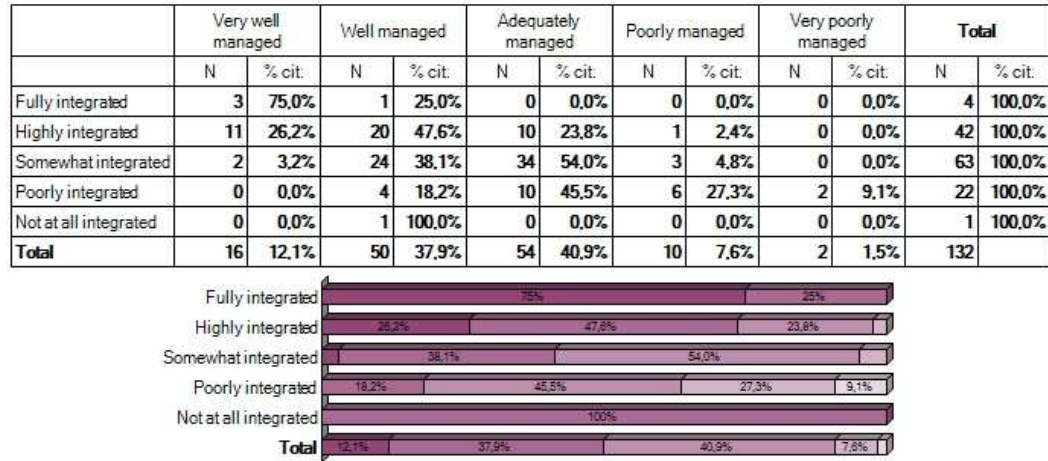


Figure 6.86: Factor Map - Internal Integration and Information Flow Management

A similar situation exists in relation to, on the one hand, the extent of integration with both customers and suppliers, and, on the other hand, the manner in which information flows are managed. Figures 6.87 and 6.88 show this data with the  $\chi^2$  tests suggesting

that dependences are highly significant (VS). This can be clearly seen in the factor maps in Figures 6.89 and 6.90.

23. How would you describe the the manner in which your company's supply chain information flows are managed?  
18. How would you describe the extent to which your company's supply chain activities are integrated with those of your customers?

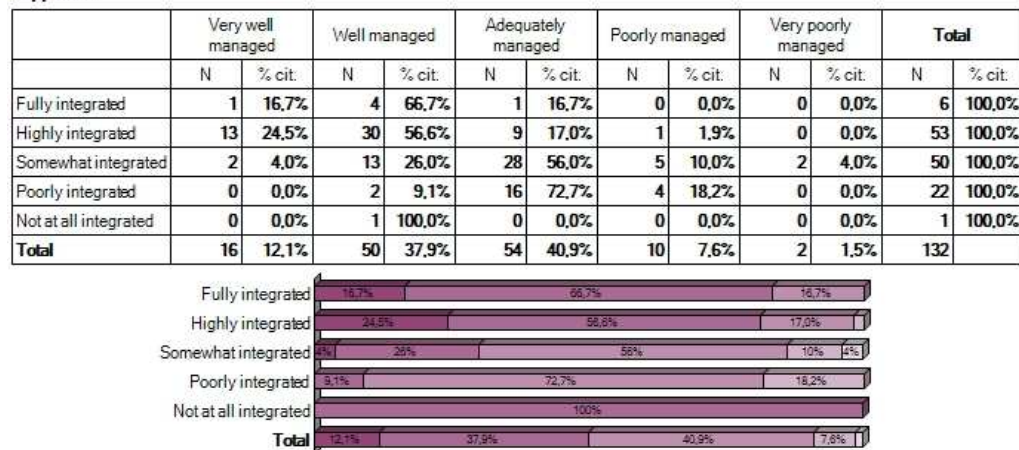


$p = <0.1\%$  ;  $\chi^2 = 62.94$  ;  $dof = 16$  (VS)

Dependence is highly significant.

Figure 6.87: Integration with Customers and Information Flow Management

23. How would you describe the the manner in which your company's supply chain information flows are managed?  
19. How would you describe the extent to which your company's supply chain activities are integrated with those of your suppliers?



$p = <0.1\%$  ;  $\chi^2 = 52.90$  ;  $dof = 16$  (VS)

Dependence is highly significant.

Figure 6.88: Integration with Suppliers and Information Flow Management

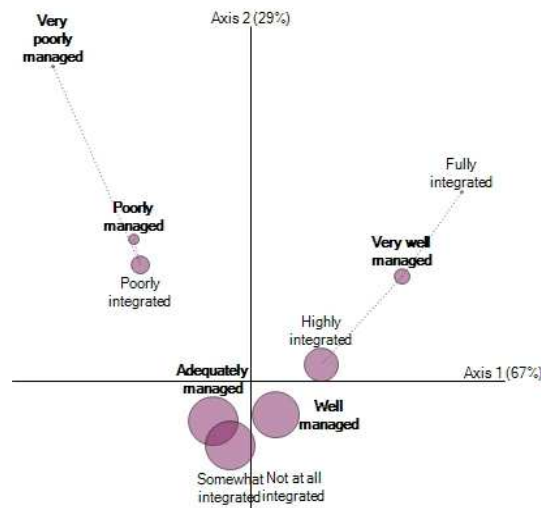


Figure 6.89: Factor Map - Integration with Customers and Information Flow Management

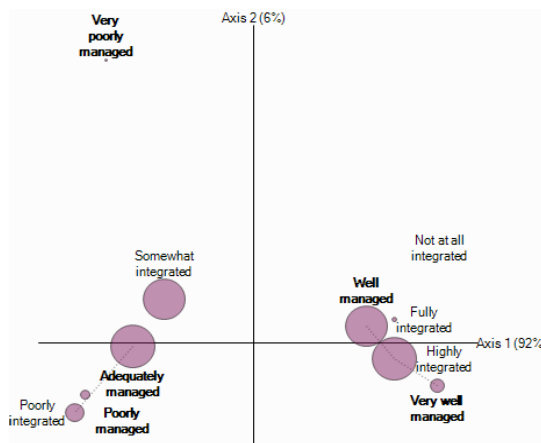


Figure 6.90: Factor Map - Integration with Suppliers and Information Flow Management

### SCI and ICT Tools Used

In terms of the relationship between ICT tools used in respondents' firms and the extent to which internal supply chain activities are integrated, the  $\chi^2$  test indicates that the level of dependence is not significant (NS). A similar situation exists with regard to integration with both customers and suppliers.

### SCI and Relationships

As shown in Figures 6.91 to 6.93, the extent to which activities are integrated is strongly correlated with the strength of relationships. The  $\chi^2$  tests indicate highly significant dependences in the case of internal integration and relationships, as well as for integration and relationships with suppliers and customers (VS). The factor maps in Figures 6.94 to 6.96 show this very clearly.

25. How would you describe the nature and extent of relationships between internal supply chain functions?  
 17. How would you describe the extent to which your company's internal supply chain activities are integrated?

	Very strong		Strong		Neither strong nor weak		Weak		Very Weak		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Fully integrated	7	63,6%	3	27,3%	1	9,1%	0	0,0%	0	0,0%	11	100,0%
Highly integrated	5	11,1%	37	82,2%	3	6,7%	0	0,0%	0	0,0%	45	100,0%
Somewhat integrated	0	0,0%	34	51,5%	27	40,9%	5	7,6%	0	0,0%	66	100,0%
Poorly integrated	0	0,0%	3	33,3%	1	11,1%	5	55,6%	0	0,0%	9	100,0%
Not at all integrated	0		0		0		0		0		0	100,0%
<b>Total</b>	<b>12</b>	<b>9,2%</b>	<b>77</b>	<b>58,8%</b>	<b>32</b>	<b>24,4%</b>	<b>10</b>	<b>7,6%</b>	<b>0</b>	<b>0,0%</b>	<b>131</b>	



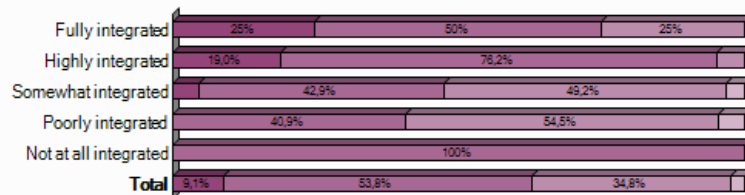
$p = <0.1\%$  ;  $\chi^2 = 96.56$  ;  $\text{dof} = 9$  (VS)

Dependence is highly significant.

Figure 6.91: Internal Integration and Relationships

26. How would you describe the nature and extent of relationships with upstream (i.e. customer) companies?  
 18. How would you describe the extent to which your company's supply chain activities are integrated with those of your customers?

	Very strong		Strong		Neither strong nor weak		Weak		Very Weak		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Fully integrated	1	25,0%	2	50,0%	1	25,0%	0	0,0%	0	0,0%	4	100,0%
Highly integrated	8	19,0%	32	76,2%	2	4,8%	0	0,0%	0	0,0%	42	100,0%
Somewhat integrated	3	4,8%	27	42,9%	31	49,2%	2	3,2%	0	0,0%	63	100,0%
Poorly integrated	0	0,0%	9	40,9%	12	54,5%	1	4,5%	0	0,0%	22	100,0%
Not at all integrated	0	0,0%	1	100,0%	0	0,0%	0	0,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>12</b>	<b>9,1%</b>	<b>71</b>	<b>53,8%</b>	<b>46</b>	<b>34,8%</b>	<b>3</b>	<b>2,3%</b>	<b>0</b>	<b>0,0%</b>	<b>132</b>	



$p = <0.1\%$  ;  $\chi^2 = 34.83$  ;  $\text{dof} = 12$  (VS)

Dependence is highly significant.

Figure 6.92: Integration and Relationships with Customers

27. How would you describe the nature and extent of relationships with downstream (i.e. supplier) companies?  
 19. How would you describe the extent to which your company's supply chain activities are integrated with those of your suppliers?

	Very strong		Strong		Neither strong nor weak		Weak		Very Weak		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Fully integrated	4	66,7%	2	33,3%	0	0,0%	0	0,0%	0	0,0%	6	100,0%
Highly integrated	13	24,5%	36	67,9%	4	7,5%	0	0,0%	0	0,0%	53	100,0%
Somewhat integrated	1	2,0%	24	48,0%	22	44,0%	3	6,0%	0	0,0%	50	100,0%
Poorly integrated	0	0,0%	9	40,9%	7	31,8%	6	27,3%	0	0,0%	22	100,0%
Not at all integrated	0	0,0%	0	0,0%	1	100,0%	0	0,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>18</b>	<b>13,6%</b>	<b>71</b>	<b>53,8%</b>	<b>34</b>	<b>25,8%</b>	<b>9</b>	<b>6,8%</b>	<b>0</b>	<b>0,0%</b>	<b>132</b>	



$p = <0.1\%$  ;  $\chi^2 = 63.97$  ;  $\text{dof} = 12$  (VS)  
 Dependence is highly significant.

Figure 6.93: Integration and Relationships with Suppliers

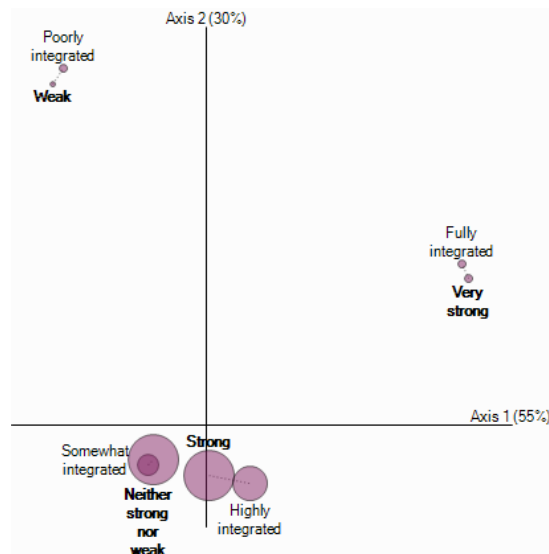


Figure 6.94: Factor Map - Internal Integration and Relationships



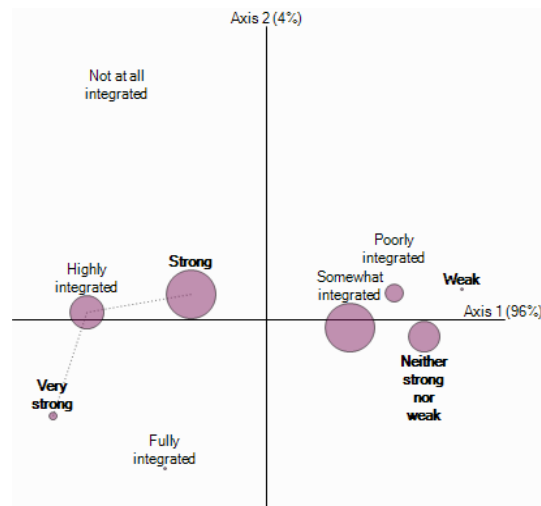


Figure 6.95: Factor Map - Integration and Relationships with Customers

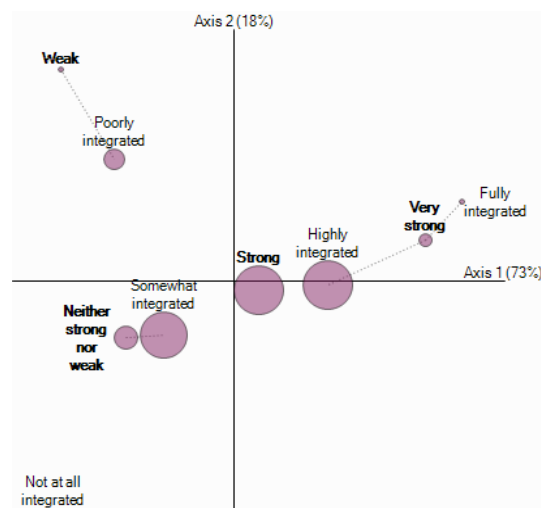


Figure 6.96: Factor Map - Integration and Relationships with Suppliers

#### 6.4.8 The Contingency Model

The contingency approach is a flexible method of analyzing bivariate relationships such as those set out in the foregoing sections (see, for example, Bryman and Bell (2003)). A contingency model provides a means of compiling the results of the various statistical tests that have been carried out by the author. Figure 6.97 shows the overall set of relationships between the variables. This comprises:

1. Relationships between all data and the various demographic variables (indicated by the bold lines);
2. Relationships between variables within the “integration”, “flows” and “relationships” groups (indicated by the plain lines); and,
3. Relationships between selected variables across groups based on the cross-sectional analysis described in section 6.4.8 (indicated by the dotted lines).



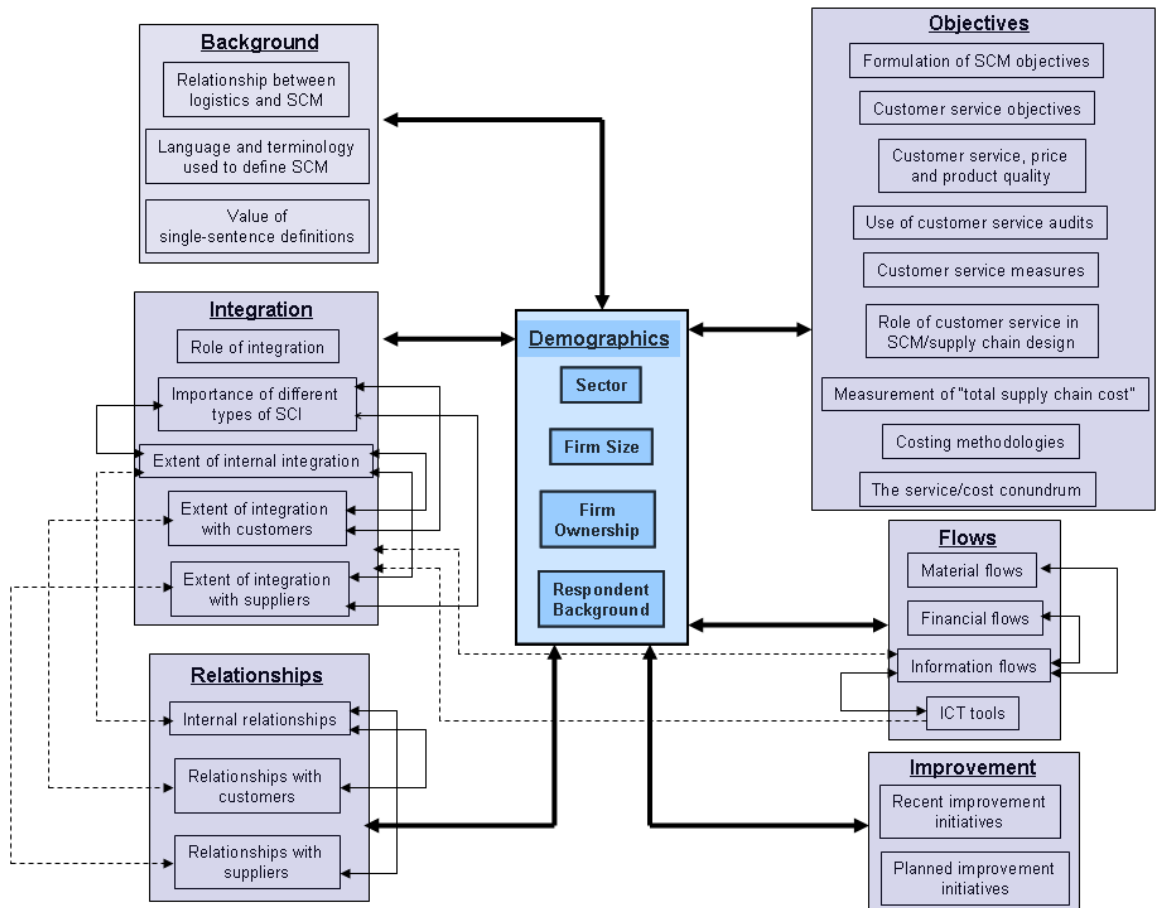


Figure 6.97: Overall Contingency Model

The relationships described in sections 6.4.1 to 6.4.6 are summarized in the demographic data contingency model in Figure 6.98. This essentially represents a decomposition of the overall contingency table in Figure 6.97. To facilitate clarity, relationships that are not significant (NS) have been omitted.

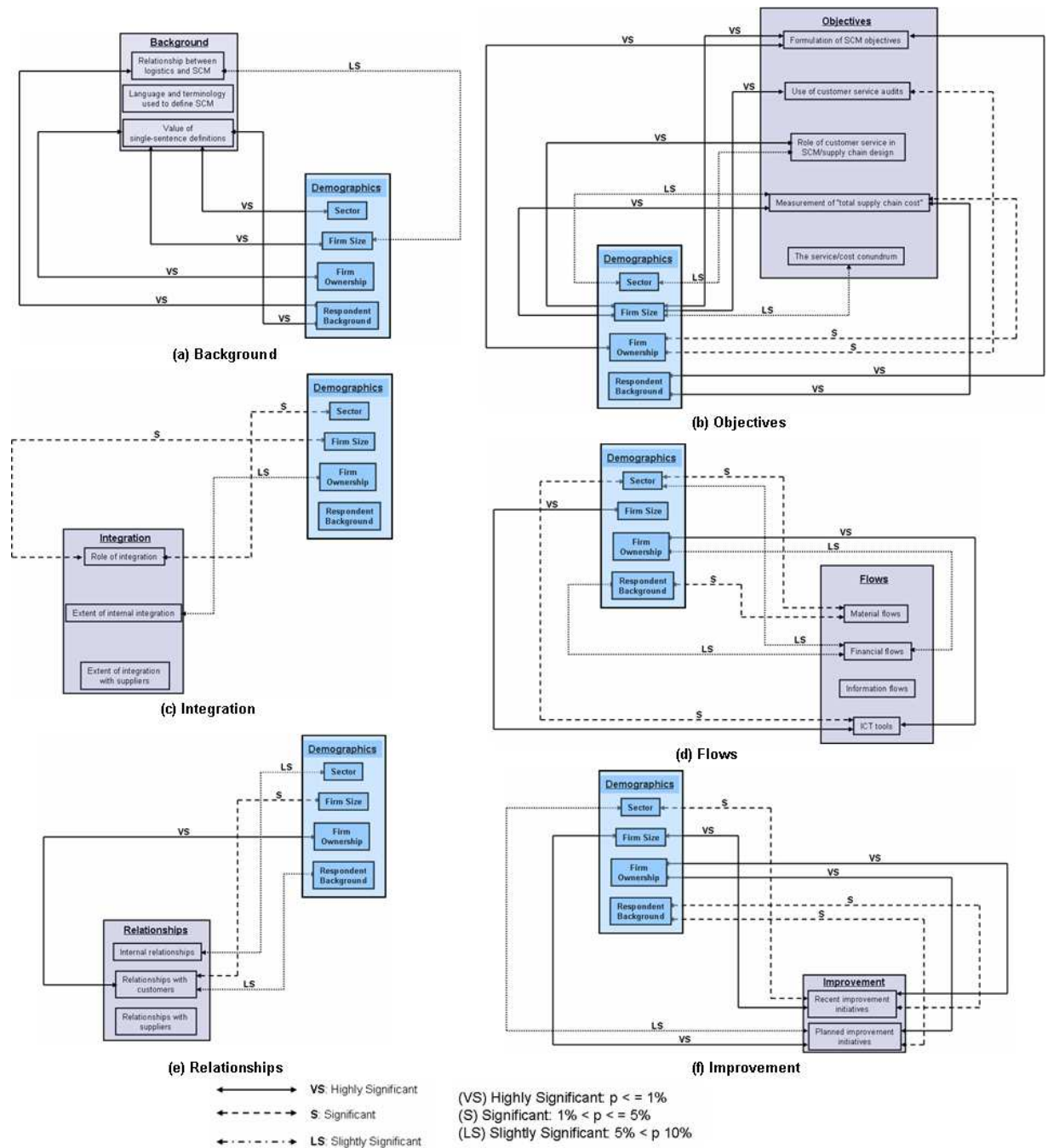


Figure 6.98: Demographic Data Contingency Model

A number of points emerge from an analysis of this contingency model.

1. Larger multinational firms and their smaller indigenous peers differ significantly in relation to the SCM practices adopted. This is particularly the case in relation to the setting of objectives, internal and external integration, the management of financial flows and integration with customers. As noted in section 6.4.6, larger

firms are more likely than their smaller counterparts to have implemented or planned major supply chain initiatives.

2. Differences exist between CSO-defined “modern” and “traditional” sectors. This is the case in relation to, for example, measurement of total supply chain cost and planned major supply chain improvement initiatives. It is also evident in the contrast between the relative clarity of responses from the former and the ambiguity and/or uncertainty of responses from the latter in relation to some of the background questions.
3. Respondent background has an impact on the answers provided. This is illustrated by the contrast between the apparent clarity and certainty that are a feature of the responses of end-to-end supply chain managers and the ambiguity that is a feature of some of the responses of function-oriented managers (for example in relation to the formulation of SCM objectives and the measurement of total supply chain cost). Similarly, the former are more likely than the latter to be aware of recently implemented or planned improvement initiatives. As noted in section 6.4.6, this may be a result of the fact that end-to-end supply chain managers are more likely to be involved in such improvement projects. The position of respondents in the chain also influences their perceptions in relation to integration and relationships (for example, a relatively high proportion of supplier-facing respondents regarded their firms as “highly integrated” with suppliers and characterised their supplier relationships as “strong” or “very strong”).

Finally, Figure 6.99 shows relationships between variables within sections and across sections (i.e. “cross-sectional”).

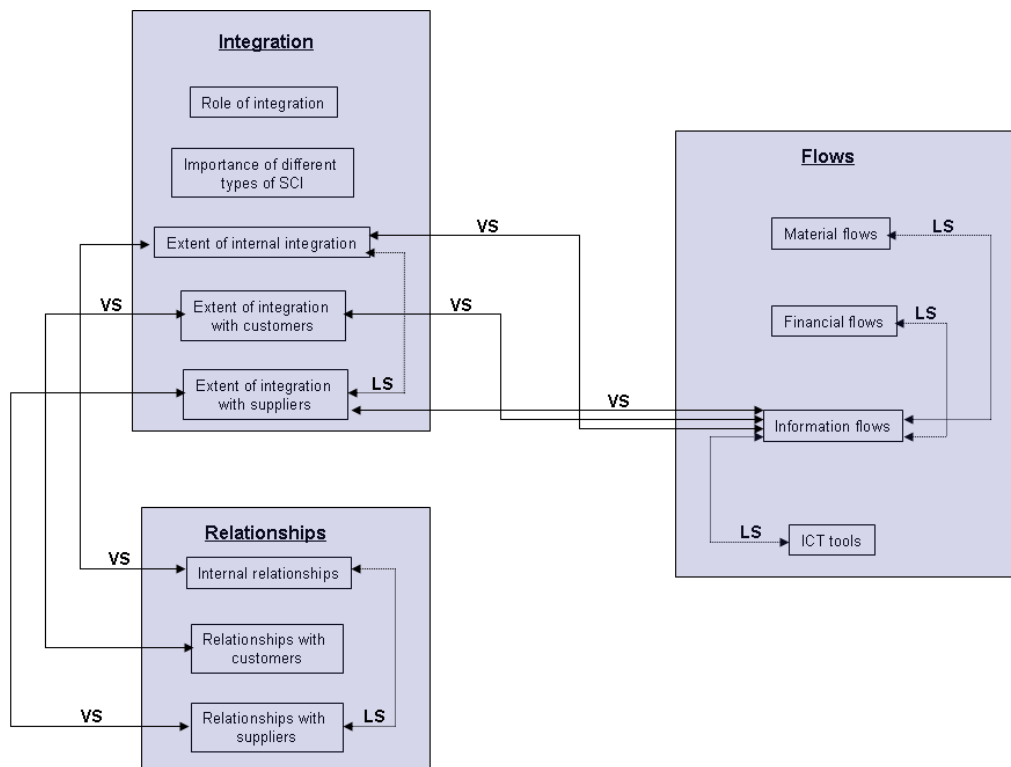


Figure 6.99: Contingency Model (within and between variable groups)

A number of points emerge from an analysis of this contingency model.

1. There is little evidence to support the view that external integration is predicated on the extent of internal integration (see section 6.4.3) or that the strength of external relationships is predicated on that of internal relationships (see section 6.4.5). Integration with suppliers is ranked as most important by respondents and this is manifested in the relatively high levels of integration with suppliers, as well as in the relative strength of relationships with suppliers.
2. The dependencies between, on the one hand, the manner in which information flows are managed and, on the other hand, the manner in which material and information flows are managed, is only slightly significant (LS). A similarly low level of significance exists between the ICT tools used by firms and the manner in which information flows are managed (see section 6.4.4). This challenges the author's assertion in Chapter 2 that the effective management of material and money flows is predicated upon the effective management of the related information flows, and that ICT is a key enabler of this process. In relation to the latter, it was further noted in section 6.4.7 that there is no significant relationship between ICT tools used in respondents' firms and the extent to which supply

chain activities are integrated. This again challenges the view posited by the author in Chapter 2 that ICT is a key enabler of SCI.

3. Notwithstanding point 2 (above), there is a highly significant dependence between the extent of internal and external SCI and the manner in which information flows are managed. This suggests that it is the nature of information management rather than the specific ICT tools used that is the critical success factor.
4. As noted in section 6.4.7, the extent to which activities are integrated is strongly correlated with the strength of relationships. This is as might be expected and suggests a high level of internal consistency (and, therefore, reliability) across the data.

#### ***6.4.9 Using Questionnaire Data to Answer RQs***

This section reviews the main findings from the questionnaire survey as they relate specifically to the RQs set out in Chapter 2. This discussion is restricted to the survey findings – an integrative analysis of data collected via focussed interviews (Chapter 4), focus groups (Chapter 5) and the survey forms the basis of much of Chapter 7.

##### **RQ1 - What is the current level of understanding of SCM in practice?**

As noted earlier, there is some evidence of variation in understanding between respondents from different backgrounds. Such variations have been described in previous sections. This reflection is based on responses to questions in section 1 of the survey (background), as well as the relatively small number of questions that specifically solicited the personal opinions of respondents (questions 11, 14 and 15).

Notwithstanding that there is some evidence from the survey that the supply chain is quite narrowly defined and understood by respondents from certain sectors and that there is a limited emphasis amongst respondents on the product life cycle orientation to the supply chain, overall the level of understanding appears to be quite high. For example, almost three quarters of respondents alluded to the need for different links in the supply chain to work together properly when defining SCM. This is in line with the essence of SCM thinking (i.e. the integration concept) as articulated in *Fundamental Two*. In line with this finding, the great majority of respondents either agreed or agreed strongly that SCM is fundamentally concerned with integration of supply chain activities, with almost two thirds of respondents defining the supply chain as being

inter-firm (i.e. external). Furthermore, the concept that “understanding customer service sets the specification for SCM/supply chain design” is recognised by the great majority of respondents, as is the notion that cost/investment and customer service optimisation need not be mutually exclusive.

There is mixed evidence in relation to the push/pull orientation of respondents. The prevalence of the word “customer” in respondents’ definitions of “supply chain” and “supply chain management” suggests that a strong customer/demand (or pull) orientation exists. However, backward integration with suppliers is regarded as more important than forward integration with customers – this suggests more of a supply (i.e. “push” orientation) in the overall approach of respondents.

In terms of the Larson and Halldorsson (2004) taxonomy, the *Four Fundamentals* construct can be characterised as “unionist-intersectionist” (see Chapter 2). As noted in sections 6.3.1 and 6.4.1, this is in line with the majority of perspectives provided by survey respondents. If – as the author contends – the *Four Fundamentals* construct represents a comprehensive definition of SCM, then this suggests that a relatively high level of understanding of the thrust of this construct exists in practice.

#### RQ2 - What is the current level of adoption of SCM?

The above observations in relation to RQ1 are based on responses to questions asked in section 1 of the questionnaire and a small number of other questions that specifically solicited the personal opinions of respondents. The following observations in relation to RQ2 are based on the responses received to the other questions, all of which solicited information about firms’ SCM practices rather than respondent opinion. As noted earlier, there is evidence of variation in relation to SCM adoption between firms based on: (i) sector; (ii) firm size; and (iii) firm ownership. Such variations have been described in some detail in previous sections. From the data analysis described in the preceding sections, a mixed picture emerges in relation to SCM adoption by firms in Ireland as shown in Table 6.28 (below).

<b><u>SCM Fundamental</u></b>	<b><u>Dimension</u></b>	<b><u>Positive</u></b>	<b><u>Negative</u></b>
Objectives	Formulation	Majority	Limited
	Customer Service Audits	Majority	
	Customer Service Measures	Range	Some Missing
	SC Costing	Methodologies	Total SC Cost
Philosophy	Internal Integration	Highly/Somewhat	Fully/Highly
	External Integration	Highly/Somewhat	Fully/Highly
	KPIs	Range	Inter-Organisational
Management of Flows	All	Very Well/Well	Adequately
	ICT	ERP	Enabler
Relationships	All	Strong	

Table 6.15: SCM Adoption

While the majority of firms do formulate specific SCM objectives, these are somewhat limited in that they relate in the main to the traditional areas of cost and customer service. Objectives that relate specifically to environmental sustainability, for example, are formulated in a small but significant number of firms. The majority of firms use customer service audits to understand customer expectations and competitor performance. A relatively wide range of customer service elements are measured with on-time delivery and product availability measured by the majority of respondents. However, some potentially important elements of customer service (e.g. information request responsiveness) are not measured in most firms. It is also worth noting that respondents rank customer service more highly than price or product quality, and that SCM objectives that relate specifically to customer service are most common (formulated in 70.5% of firms). Combined with the fact that the great majority of respondents concurred with the notion that customer service sets the specification for supply chain design and management, the evidence suggests that this key concept is well embedded in firms' thought processes. Although "total supply chain cost" is measured in less than a quarter of firms, wide use is apparently made of formal costing methodologies such as ABC.

In relation to SCI, the fact that the great majority of respondents indicate that internal activities were either "highly integrated" or "somewhat integrated" could be interpreted as being positive. However, given that half of the respondents suggested that their internal supply chain activities were only "somewhat" integrated suggests that there is significant room for improvement in this area. A similar picture exists in relation to

external integration with large numbers again suggesting that their activities were only “somewhat” integrated with those of their customers and suppliers (47.7% and 37.9% respectively). For example, just 34.8% of respondents assessed their activities as being fully or highly integrated with those of the customers (the equivalent percentages for internal and supplier integration are 42.4% and 44.7%). While firms measure a wide range of performance parameters, there is little evidence of any genuinely inter-organisational KPIs being used.

The majority of firms suggested that material and money flows are well or very well managed. However, a significant number of respondents suggested that material, money and – in particular – information flows were only “adequately” managed. This again suggests that there is significant room for improvement in how flows are managed, particularly information flows. In terms of ICT adoption, the majority of firms indicated that they used enterprise solutions (i.e. ERP). However and as noted in section 6.4.8, the analysis challenges the view that ICT is a key enabler of SCI.

Finally, relationships – both between internal functions, as well as with external customers and suppliers – were judged to be strong in the majority of firms.

While major supply chain improvement initiatives have been undertaken in the majority of firms during the last two years, the majority of respondents indicated that their firms either had no major supply chain initiative planned for the next two years or were unaware of any such initiative. It is interesting to note that the majority of implemented and planned improvement initiatives are characterised as either technological or operational (i.e. rather than people-related or strategic). This suggests that the focus of improvement continues to be quite limited despite the evidence that planned future initiatives have a more strategic and chain-wide orientation than their predecessors.

### RQ3 - What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?

Given the largely qualitative nature of this question, it is not possible to use the questionnaire data in isolation to answer this question in any meaningful way. Nonetheless, some possible critical success factors and inhibitors to success may be implied from the responses provided by participants to some of the questions.



Firstly, firm demographics impact significantly on the extent to which SCM theory is implemented in practice, with smaller indigenous firms (particularly in “traditional” sectors) lagging behind their larger multinational counterparts, most of which operate in “modern” sectors. Secondly, an interesting picture emerges in relation to the core SCM concept of integration. Backward integration (i.e. with suppliers) is regarded as the most important form of SCI with integration of internal activities regarded as least important. High levels of integration are predicated on strong relationships with respondents regarding the latter as being strong internally, as well as with external customers and suppliers. The relatively low level of importance attached to internal integration might suggest that respondents feel that their firms have made progress in this area over time. However, this does not necessarily appear to be the case as a minority of respondents suggested that their internal activities were either fully or highly integrated. It is also interesting to note that despite being regarded as the most important form of integration, a minority of respondents suggested that their firms’ activities were either fully or highly integrated with those of their suppliers. Thirdly, the data suggest that there may be a lack of a strategic approach in terms of planning and implementing supply chain improvement initiatives. This is illustrated by the fact that a minority of firms (35.6%) formulate objectives that relate specifically to supply chain investment, and that a minority of past and planned improvement initiatives could be regarded as strategic or chain-wide. Finally, and as noted in section 6.4.8, the analysis suggests that it is the way in which information flows are managed – i.e. rather than the specific ICT tools that are used – that is a critical success factor.

RQ4 - What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?

As built into the research design described in section 3.5, answering this question requires an analysis of all data collected during the empirical part of this study – this integrated analysis will be the focus of much of Chapter 7. It is not possible, therefore, to generate many meaningful insights into this question using the questionnaire data alone. However, questionnaire respondents were asked about policy initiatives that could be adopted to facilitate wider adoption of SCM and figure 6.84 shows a breakdown of the 28 usable responses received. Many possible measures were proposed with the most common relating to education and training initiatives.

## **6.5 Summary/Conclusion**

This chapter has described the third and final phase of the author's empirical work, namely the questionnaire survey. The data generated has provided some useful insights into each of the author's four research questions. As noted in Chapter 3, what is important in this research is how the findings from each element of the empirical work (i.e. focussed interviews, focus groups and the questionnaire survey) together provide answers to these questions. The focus of Chapter 7 is on this integrative analysis in line with the methodological pluralism – and associated use of combinatory data collection and analysis techniques – that is central to the author's overall research design.

## CHAPTER 7

### DISCUSSION OF FINDINGS

#### 7.1 Introduction

This chapter integrates the work described in the previous chapters of this thesis. It does so by firstly discussing the findings from the three phases of the author's empirical research in a holistic and integrated manner (section 7.2). As noted in section 3.5, while each phase aimed to address one or two of the RQs specifically (as shown in Figure 3.5) the research was designed so that all phases could potentially contribute to the generation of insights into all RQs. This is in line with the concept of methodological pluralism. It goes on to relate these findings to the existing body of scholarly knowledge. It does so by relating the empirical research findings to: (i) the author's *Four Fundamentals* construct (section 7.3.1); and, (ii) other relevant themes from the literature review in Chapter 2 (section 7.3.2). The former enables a description of how this construct was refined to reflect the empirical evidence, while the latter ensures that the empirical findings are linked to key contemporary issues and debates in the extant literature. Some final reflections are then introduced by way of summarising and concluding this chapter (section 7.4).

#### 7.2 Integrated Discussion of Empirical Findings

This section discusses the findings from the three phases of the author's empirical research in a holistic and integrated manner. It does so with specific reference to the four research questions (RQs) set out initially in section 2.15. This discussion does not purport to answer each of the questions in a definitive manner; rather, it provides fresh insights into the issues under investigation.

##### **7.2.1 RQ1 - What is the current level of understanding of SCM in practice?**

As noted in section 3.5, phases I and II of the empirical research provide the primary mechanism for answering RQ1. Sections 4.4 and 5.4 described how the more qualitative components of the work (i.e. the focussed interviews and focus groups respectively) can be used to answer RQ1. In addition to its primary role in answering RQ2, the questionnaire survey was designed so that insights would also be generated in relation

to the other RQs. Section 6.4.9 discussed these insights as they apply to the all RQs (including RQ1). This section focuses on how the findings from the questionnaire survey of phase III can be used in conjunction with the more qualitative findings to provide further insights into RQ1.

Firstly, it should be recognised that there was a degree of divergence among the six key informants interviewed during phase I of the empirical research in relation to what the supply chain and its management entails. A comparison of the interview findings with those from phases II and III of the research (i.e. the focus groups and questionnaire survey) further highlights this divergence. For example, the word “network” was commonly used by interviewees in phase I but not to as great an extent by survey respondents in phase III (see word cloud in Figure 6.26). Focus group participants – particularly FG1 (see Table 5.1) – did, however, use the concept of a “network of companies” in articulating their understanding of SCM. Similarly, the “flow” concept was referred to extensively by phase I interviewees and by all three focus groups but to a much lesser extent by survey respondents (see word clouds in Figures 6.26 and 6.27). However, much of this divergence is a question of emphasis and language rather than an indication of fundamental differences of substance. Furthermore, the different forms of data collection used by the author are likely to have impacted on the precise language used by informants. Secondly, the findings – particularly, but not exclusively, from the questionnaire survey – suggest that quite a narrow view of SCM prevails in some sectors – particularly in those defined by the CSO as “traditional”. For example, many respondents from the retail and motor sectors considered that SCM was simply about the management of suppliers and the supply base (see section 6.4.1).

Notwithstanding the above caveats, all three phases of the empirical research suggest that the overall level of understanding of SCM is generally quite high. The findings from phase I (see Table 4.2) indicate that interviewees’ understanding of the supply chain concept is very much in line with the *Four Fundamentals* construct thus suggesting a high level of comprehension of the concept. As noted in section 5.4.2, the author’s analysis of the findings from phase II suggests that a thorough understanding of the main elements of SCM is evident from the focus group sessions. Similarly (and as noted in section 6.8.9), the author’s analysis of the data from phase III concluded that the level of understanding of SCM appears to be quite high.

In relation to informants' understanding of the logistics concept, there was a much higher level of agreement. Section 4.4.2 noted that most interviewees considered logistics to be primarily concerned with the movement and storage of product. Nothing of any significance emerged from any of the focus group discussions that was not in accordance with this view and the great majority of survey respondents indicated that logistics is primarily concerned with transportation (i.e. "move") and/or transportation and storage (i.e. "move/store") in the supply chain (see Figure 6.31). It is interesting to note that just one phase I interviewee (from the electronics sector) and one focus group (FG3 – see Figure 5.4) specifically alluded to the reverse logistics concept. FG3 did generally agree that this was an aspect of logistics/SCM that was likely to grow in importance in the future in the light of legislative developments and increased environmental awareness.

The taxonomy of Larson and Halldorsson (2004) provides a useful way of establishing a profile of companies in terms of their understanding of the relationship between SCM and logistics (see section 2.10.2). As shown in Table 4.2, three of the phase I interviewees were characterised as "unionist/intersectionist", one as "intersectionist/unionist", one as "unionist" and one as "re-labelling". This is broadly in line with the findings from phases II and III. For example, almost 90% of questionnaire survey respondents fell into the "unionist" category (see Figure 6.3) but with a significant minority specifically noting that logistics is concerned with operational issues associated with the execution of the supply chain (i.e. a largely "intersectionist" perspective). The model proposed in Figure 4.3 illustrates this approach. It was inductively developed based entirely on the findings from phase I. The findings from phases II and III support the model's validity. For example, in the questionnaire survey the "make" (i.e. NACE C - "manufacturing"), "move"/"store" (i.e. NACE H – "transportation and storage") and "sell" (i.e. NACE G – "wholesale and retail trade") links in the "buy-make-store-move-sell" model represent 24.2%, 9.0% and 57.8% respectively of the total population. Thus, over 90% of the sample surveyed by the author is from these core supply chain domains. As the findings from the survey are wholly in line with the model – as indeed are the focus group findings – this suggests it provides a robust representation of the relationship between the SCM and logistics domains. The model can in turn be regarded as being an integral element of the *Four Fundamentals* construct – see section 7.3 (below).

### ***7.2.2 RQ2 - What is the current level of adoption of SCM?***

As noted in section 3.5, phase III of the empirical research provides the primary mechanism for answering RQ2. Section 6.4.9 explained how the questionnaire survey findings were used to provide insights into this question (and, indeed, the other three RQs). It was further noted in section 3.5 that these insights will be will be supplemented with deeper and richer insights generated during phases I and II as appropriate. This section focuses on how the findings from the questionnaire survey of phase III can be supplemented with the focussed interview findings from phase I, as well as with the focus group findings from phase II, to provide further insights into RQ2.

The discussion in section 7.2.1 (above) reveals a relatively high level of understanding of SCM thinking among respondents. However, from the author's analysis of the questionnaire survey data (see section 6.8.9) a mixed picture emerges in relation to SCM adoption by firms in Ireland as shown in Table 6.28. For example and as noted in section 6.4.8, larger multinational firms and their smaller indigenous peers differ significantly in relation to the SCM practices adopted in terms of the setting of objectives, internal and external integration, financial flow management and customer integration. Similarly, significant differences exist between the practices of firms in the CSO-defined "modern" and "traditional" sectors. This is the case in relation to, for example, measurement of total supply chain cost and planned major supply chain improvement initiatives.

Two specific points from phases I and II of the empirical research perhaps point to the crux of the issue in this regard. One of the interviewees in phase I (Manufacturer 2 - a large indigenous producer of food and allied products) was knowledgeable in relation to SCM concepts and definitions. However, he suggested that "management of the supply chain was an aspirational and theoretical notion" (see Table 4.1). During one of the focus group sessions (FG3), the MAN9 participant raised the specific question as to whether high levels of internal integration were a pre-requisite for external integration. As noted in section 5.2.3, there was general agreement – at least on a conceptual level – that this was the case. However, participants struggled to illustrate this opinion with concrete practical examples. Both examples are illustrative of the point made by Storey et al. (2006) when they asserted that (see section 2.15.1):

While there is an emerging body of theory which ostensibly offers a relatively coherent and compelling prescriptive narrative, predominant practice is at considerable odds with this conceptualisation (p. 755).

In general, the author's findings from all three phases of the empirical research are very much in line with this perspective. This goes to the kernel of the issue under investigation in this thesis – i.e. the divergence between theory and practice. In an Irish context, the author's findings strongly support the existence of such a divergence. An apparently high level of understanding of SCM concepts and principles among the great majority of informants across all phases of the research coexists with a relatively low level of adoption of some of these concepts and principles in reality. It appears that an “understanding into action conundrum” or an “implementation deficit disorder” exists.

Given the centrality of the integration concept in SCM (see section 2.9.1), the author paid specific attention to this issue in the analysis of findings across the three phases of empirical work. A comparison between phase I of the author's empirical research and the earlier study of Lummus et al. (2001) indicated that there appeared to be a stronger emphasis in the former the external dimension of integration (see section 4.4.5). Notwithstanding the difficulties implicit in making such comparisons, it was surmised that this may be an indication of progress in relation to internal aspects of integration over the decade between the two studies. In line with this, the questionnaire survey data (see Table 6.5) revealed that internal integration was regarded by respondents as the least important of the four levels of integration posited by Fawcett and Magnan (2002). In other words, the evidence suggests that attempts to build highly integrated inter-firm networks require that high levels of intra-firm integration are already in place, and that some progress had been made in relation to the latter. However, the primary emphasis of focus groups participants was on the internal dimension. For example, FG1 referred to “integration of intra-firm business process” (see Figure 5.2) and FG2 had a strong focus on “organisational design” and the “fragmentation to integration” concept in this context (see Figure 5.3). As noted above, while there was general agreement in FG3 that high levels of internal integration were a pre-requisite for external integration – in line with the conventional wisdom in this regard – participants struggled to illustrate this opinion with concrete practical examples. However, analysis of the questionnaire survey data showed that there is little evidence to support the conventional wisdom – as articulated by, for example, Lambert (2004) and Kotzab et al. (2011) – that external integration is predicated on the extent of internal integration. Similarly, there was little

evidence to suggest that the strength of external relationships is predicated on that of internal relationships. A study by Mena et al. (2009) in the UK food and drink sector challenged this conventional wisdom and suggested that it is possible to have relationships with suppliers and customers that are more collaborative than those between functions within an organisation. The author's survey data supports this view as it reveals that many firms have higher levels of integration – and stronger relationships – with suppliers and customers than they do internally.

In the context of RQ2, it is appropriate to explore the extent to which practices have changed over time. A comparative analysis of the phase I of author's empirical work and the previous study of Lummus et al. (2001) upon which it is based is difficult for the reasons set out in section 4.4.5. Notwithstanding this caveat, the two studies do not reveal that practitioner perspectives have progressed significantly over the last decade and/or that geographical differences exist. However, larger scale surveys of opinion would be needed for hypotheses about such differences to be deductively tested. It is also difficult to make direct comparisons between phase III of the author's empirical work and an earlier investigation into the SCM practices of firms in Ireland (NITL, 2005) as they adopted quite different methodological approaches and were carried out with quite different overall goals. However, a number of questions in the author's questionnaire survey were worded in a manner that would facilitate a degree of comparison with the earlier empirical study (see section 3.8.5). The earlier study suggested that, while pockets of SCM excellence did undoubtedly exist, there was significant room for improvement. The current research suggests that, while improvements have taken place during recent years, this overall picture has not changed to any great extent. Replication of the current study over time would allow a longitudinal profile of SCM adoption to be developed. Part of the author's literature review as presented in Chapter 2 involved an analysis of earlier empirical studies directly relevant to the current research. The 90 previous empirical SCM/logistics studies that were reviewed in some detail (see Appendix 7) used a wide variety of methodological approaches and data collection methods. This makes direct comparison between the studies very difficult and suggests that there is significant scope for replication of empirical studies that are robust and well informed by the extant literature. Section 8.4 explores this and other possible avenues of potentially fruitful research in more detail.



### 7.2.3 RQ3 - What are the critical success factors and/or inhibitors to success in putting SCM theory into practice?

As indicated in the overall research design in Figure 3.5, insights into this question were largely derived from more qualitative phases of the author's empirical work (i.e. the focussed interviews and focus groups). As with RQ1, the survey questionnaire was carefully designed with a view to facilitating its use in answering RQ3 – section 6.4.9 describes the main issues that emerged from the analysis in this regard. In essence – and as set out in section 3.5 – the purpose with RQ3 is to inductively develop a comprehensive list of critical success factors and/or inhibitors to success using the findings from the focussed interviews and focus groups, as well as from the author's analysis of the questionnaire survey data. Figure 7.1 shows the main issues that emerged. They are grouped into clusters to facilitate explanation and interpretation.

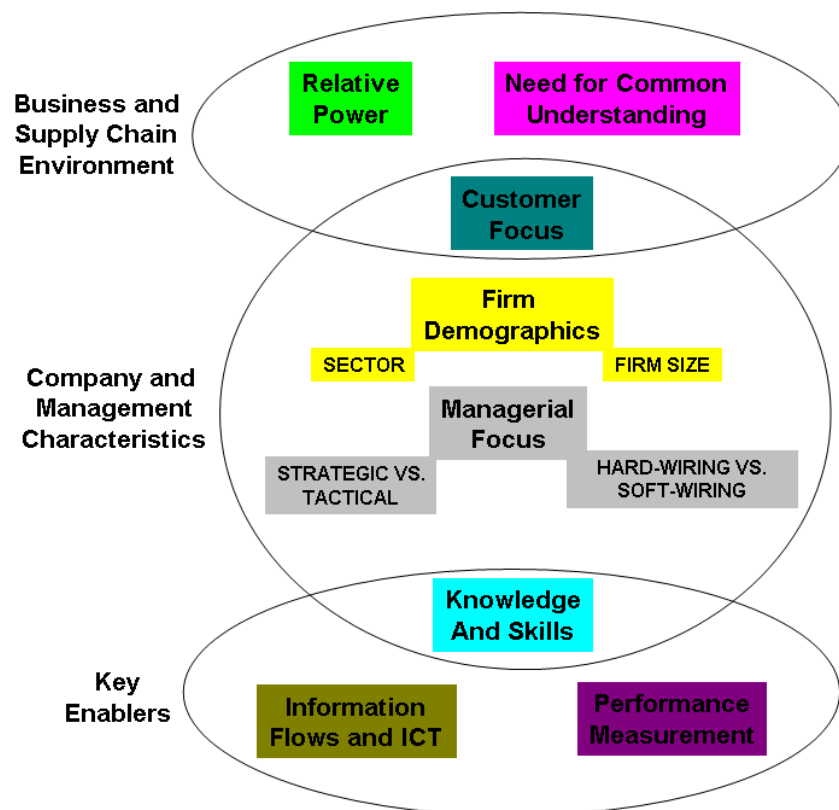


Figure 7.1: Critical Success Factors and/or Inhibitors to Success

#### Business and Supply Chain Environment

The first two factors are part of the business environment within which a firm and its wider supply chain operates. The first issue in this cluster relates to the *relative power* of firms in the supply chain. One interviewee specifically raised this issue during phase I of the author's empirical work. As noted in section 4.4.4, Retailer 1 (a large department store) suggested that its relative power over suppliers was such that the

development of relationships based on trust was not deemed to be necessary. In phase II of the work, FG1's reflection on the *Four Fundamentals* suggested that the construct needed to have a stronger emphasis on the relative power of firms and its impact in determining the dynamics of the supply chain as a whole. In other words, the degree of power and influence of each party to a relationship strongly influences the nature of relationships between firms in the supply chain. This echoes the view of Croom et al. (2000) and suggests that the relative power of any supply chain actor influences the SCM adoption process and is, therefore, a critical success factor.

The author's *Four Fundamentals* construct was developed to answer a call in the extant literature for the development of a *common understanding* of SCM. Two components of the author's empirical work involved the specific exploration of issues along horizontal supply chains and both were revealing in this context. In the phase I focussed interviews there was a degree of divergence among the six key informants from different links across the supply chain (i.e. manufacturing, 3PL/distribution and retail) in relation to what the supply chain and SCM entails. Based on this and as noted in section 4.5, the development of common definitions and understandings between supply chain partners would appear to be a critical success factor; the corollary of this is that a lack of definitional consistency and common understanding may be an inhibitor. The discussions during the focus group sessions – particularly FG2 – reinforced this view. A general consensus emerged during that group's discussion that, while traditional approaches such as the "seven rights" provide a checklist of the main objectives of SCM, they do not represent comprehensive definitions of the domain (see section 5.2.2). More interestingly in this context, the FG2 discussion amongst practitioners from the food industry suggested that firms from different parts of the same supply chain can have different emphases and understandings, and that this can negatively impact on attempts to achieve higher levels of integration. The key here is that supply chains – by definition – involve actors from different backgrounds and with different levels of understanding, and that the development of more consistency in terms of terminology and understanding is an important pre-requisite for increased collaboration and integration.

#### Company and Management Characteristics

Phases II and III of the author's empirical work highlighted the need for a strong *focus on customer requirements* and a concomitant pull-orientation. Customers are part of a

firm's business environment and also define (or "set the spec" – see section 2.8.2) for integrated SCM (Korpela et al., 2001). FG1 was strongly of the view that the *Four Fundamentals* construct needed to further emphasise the importance of customer focus (see section 5.2.1). From the questionnaire survey there is mixed evidence in relation to this issue. The prevalence of the word "customer" in respondents' definitions of the phrases "supply chain" and "supply chain management" suggests that a strong market/demand (i.e. pull) orientation exists. However, backward integration with suppliers was regarded as more important than forward integration with customers – this suggests more of a supply (i.e. push) orientation. In any case, the concept that SCM is driven by customer demand is clear from the literature (see Chapter 2), and the associated concept that clear customer focus is a critical success factor is evident from the author's empirical research.

As noted in section 6.4.9, the results from phase III of the author's empirical work suggests that *firm demographics* – notably sector and size – impact significantly on the extent to which SCM theory is adopted in practice. In terms of sector, firms in CSO-defined "traditional" sectors lag behind their counterparts in the "modern" sectors. In terms of size, smaller (and mainly indigenous) firms also lag behind their larger (and mainly multinational) counterparts. Interestingly, no significant differences exist by sector or firm size in terms of how respondents rank customer service relative to price and product quality. This suggests that the broad dynamics of different markets have evolved in a similar manner and can not explain the divergence in SCM adoption. However, both the author and the focus group facilitator noted the different perspectives of participants from different sectors during the focus group sessions. In general, this was in line with "traditional" and "modern" sectors. For example, companies operating in the electrical/electronics and FMCG sectors (e.g. MAN1, MAN3, MAN4, MAN5, MAN7, MAN9 and many of the 3PL participants) appeared to have more advanced practices and tools in place than their peers in the more highly regulated sectors (e.g. MAN2, MAN6, MAN9 and the three public sector participants). In general, the evidence suggests that sector and firm size both have an impact on the level of adoption of SCM and could, therefore, be regarded at one level as critical success factors. However, the author recognises that supply chain managers are likely to have little, if any, influence over such demographic factors. It should be emphasised, therefore, that while these factors appear to have influenced SCM adoption levels to date, they should not be regarded in themselves as inhibitors to success. Indeed, the relatively low of

diffusion of SCM principles in smaller firms in the “traditional” sectors suggests that a latent development potential exists in such firms.

The next issue in the second cluster relates to the culture of a firm and its managers and – in particular – what might be best described as its *managerial focus*. The empirical findings raise two separate but interdependent issues in this regard. The first relates to the distinction between strategic and tactical foci on SCM. The deliberations of FG3 were particularly instructive in this regard. The most senior participant and the only one with genuine end-to-end supply chain responsibility (MAN6) asserted that SCM is first and foremost a strategic issue. He also pointed to some of the inherent dangers in adopting a mainly tactical or operational focus. As noted in section 5.2.3, these assertions found strong resonance in the group. In a similar vein, several participants in FG3 (notably MAN8) provided examples that illustrated the role of SCM as a source of strategic differentiation. Despite this recognition of the strategic nature of SCM, all participants expressed a degree of frustration with their lack of involvement in the more strategic dimension of the subject. This lack of strategic focus is also evident in the questionnaire survey findings with the data suggesting that: (i) a minority of firms (35.6%) formulate objectives that relate specifically to supply chain investment; and, (ii) a minority of past and planned improvement initiatives could be regarded as strategic or chain-wide. In line with the foregoing, the role of leadership and senior management in developing appropriate supply chain strategies was emphasised throughout the discussions of FG1 and FG3 (see section 5.4.3). These findings suggest that the adoption of a strategic focus in relation to SCM is a critical success factor. The corollary of this is that the adoption of a primarily operational or tactical approach is an inhibitor to success. The second focus issue relates to the relative emphasis of firms on “soft-wiring” and “hard-wiring” as discussed in section 2.11.5. This is clearly illustrated in relation to the past and planned improvement initiatives of survey respondents. Just three of the 70 usable responses received referred specifically to a people dimension in their past improvement initiatives. In relation to planned future initiatives, technology-oriented improvements are easily the most common. In line with the foregoing, the role of employee involvement and “buy-in” to the supply chain change process was emphasised throughout the discussions of FG1 and FG3 (see section 5.4.3). There was broad agreement that these people-related issues should be at the core of any worthwhile definition of SCM. The relative neglect of the people dimension (i.e. the “soft-wiring”) would appear to be an inhibitor to success, i.e. the critical success factor

is the appropriate incorporation of “soft-wiring” considerations into supply chain decision making. As noted in section 2.11.5, the development of appropriate *knowledge and skills* (see below) plays a key role both in shaping the orientation of managers and in addressing these “soft-wiring” considerations.

### Key Enablers

The final cluster relates to issues that could be regarded as key enablers of SCM. The first of these concerns *SCM knowledge and skills*. This issue was raised by a number of interviewees during phase I of the empirical research with a strong focus on the importance of education and training development. As noted in section 4.4.4, 3PL1 had a particularly strong emphasis on the need for the education process to develop more clarity of understanding of the supply chain and its mechanics. When survey respondents were asked to suggest possible policy initiatives that could be adopted to facilitate wider adoption of SCM, by far the most common response type related to education and training (see section 6.4.6). These findings suggest that the development of the requisite skills and knowledge through appropriate education and training is a critical success factor. As noted in the context of the focussed interviews in section 4.4.4, it also raises issues in relation to supply chain learning – the leveraging the supply chain as a mechanism to enable learning and competence development (see: Bessant et al, 2003; Sweeney et al, 2005). Section 2.11.5 suggested that this area is still in need of development.

The next significant issue to emerge as a critical success factor from the various phases of the author’s empirical work relates to the management of *information flows and ICT*. There was a strong emphasis in the focussed interviews on information flow management (see table 4.1). However, the role of technology and ICT tools was not specifically mentioned by any interviewee. In FG1, all participants agreed the information flow management was a central issue in SCM with several providing an overview of the ICT systems used in their organizations. The discussion of FG2 resulted in the general consensus that management of the key flows – including information flows – provides the basis for effective supply chain control. FG3 participants were also broadly in agreement in relation to the importance of information flow management. The survey questionnaire findings are interesting in this regard. The importance of information flows was generally acknowledged but a significant number of respondents suggested that they were only “adequately” managed and that room for improvement

exists in this area. Furthermore, the analysis in section 6.4.8 suggested that the way in which information flows are managed, rather than the specific ICT tools that are used, is a key enabler of integration and, therefore, a critical success factor.

The importance of effective *performance measurement* was a recurring theme during the focus group phase of the author's empirical research. FG1 agreed that this was a key enabler of continuous improvement. FG3 reinforced this view and agreed that inappropriate KPIs can accentuate fragmentation between supply chain processes (both internally and externally). The general consensus was that determining an appropriate set of metrics is very dependent on the specific nature of a firm's markets, customers and cost drivers, as well as on other strategic imperatives. In line with this, the questionnaire survey indicated that a wide range of parameters are measured in respondents' organisations. However (and as noted in section 6.4.9) there is little evidence of any genuinely inter-organisational KPIs being used. These findings reinforce the "what gets measured gets done" axiom (see section 2.9.4) and suggests that the establishment of a robust and integrated supply chain performance measurement system is a critical success factor.

Having described the various constituent elements of Figure 7.1 in some detail, it is worth returning to the totality of what this schematic represents. The top cluster ("Business and Supply Chain Environment") recognises that there are issues beyond the boundary of the firm that critically impact on SCM adoption. These are part of what Kotzab et al. (2011) refer to as "joint or external SCM conditions" based on their analysis of ten different frames of reference<sup>38</sup> "to determine the constitutional or antecedent elements of SCM adoption and execution" (p. 233). In practice, this suggests that managers need to at least have an understanding of these external issues and the way in which they influence the SCM-readiness of a particular organization. The second cluster ("Company and Management Characteristics") highlights the need for a customer-focused strategic response that recognises the importance of the people dimension and the attendant need to develop appropriate knowledge and skills. These are part of what Kotzab et al. (2011) refer to as "internal SCM conditions" as they reside inside an organization. The bottom cluster ("Key Enablers") focuses on two of the critical enablers of the supply chain change management process.

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<sup>38</sup> Including those of Bechtel and Jayaram (1997), Fawcett and Magnan (2001), Mentzer et al. (2001) and Kotzab et al. (2006)

The approach inferred in Figure 7.1 shares some characteristics with Gattorna's strategic alignment model (Gattorna, 2003) introduced in section 2.2.4 and shown in Figure 2.3. The top-level linkages are shown in Figure 7.2 (below).

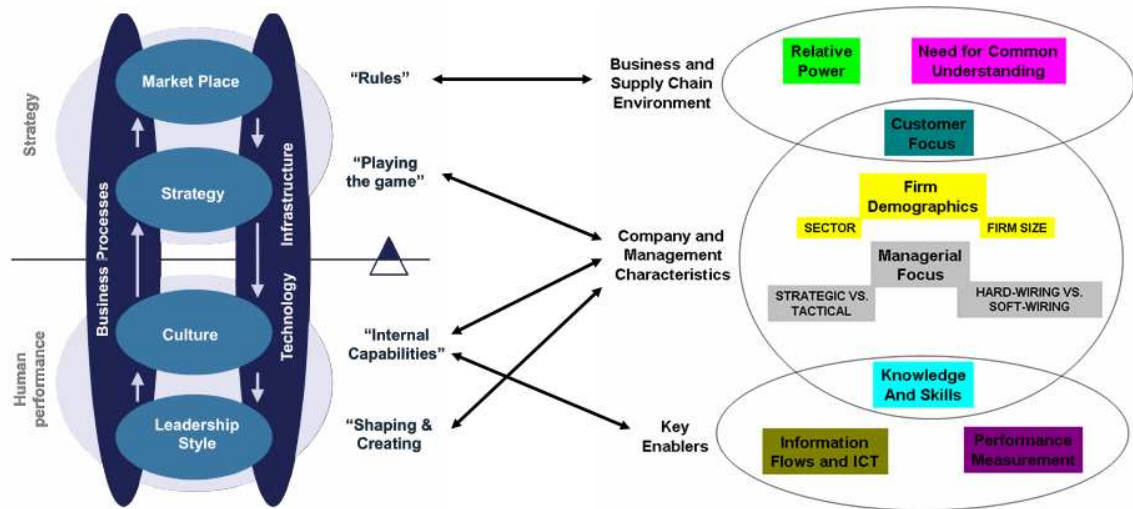


Figure 7.2: Critical Success Factors and the Strategic Alignment Model

The “rules (of the game)” come from the dynamics of the business and supply chain environment, in particular from a firm’s understanding of customer and market requirements. The customer-focused strategic response (“playing the game”) depends on the company’s characteristics and those of its management. The “internal capabilities” of the firm (of which “culture” is key element) are also determined to a large extent by these characteristics (in particular its approach to “human performance” and other soft-wiring issues), as well as by some of the key information and measurement enablers. Finally, the “shaping and creating” of a company’s culture and its strategy depends on the focus of managers and, in particular, on their strategic/tactical orientation.

#### ***7.2.4 RQ4 - What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?***

Developing insights into this question is primarily concerned with identifying the implications of the author’s findings at policy, supply chain and firm levels. The essence of this is to ensure that any practical measures proposed address the critical success factors and/or inhibitors to success set out in Figure 7.1. This issue will be

returned to in Chapter 8. This section focuses on issues that were specifically raised during the various phases of author's empirical work that suggest possible measures.

As part of the questionnaire survey, respondents were specifically asked about measures that could be adopted to facilitate wider adoption of SCM with the results shown in Figure 6.84. As noted in section 6.4.6, the most common response related to education and training with several respondents suggesting that support be provided for such initiatives. This, as well as the other four most common responses, is shown in Table 7.1 with an indication of the relevance of each at the three levels, i.e. policy, supply chain and firm. These possible measures all found expression among phase I and II informants to greater or lesser extents.

<b>Measure Type/Level</b>	<b>Firm</b>	<b>Supply Chain</b>	<b>Policy</b>
Educational	X	X	X
Recognition	X		
Technology	X	X	X
Environment	X	X	X
Market Information			X

Table 7.1: Possible Measures to Improve SCM Adoption

As well as being the most common response from survey respondents, the issue of knowledge and skill development was raised by a number of interviewees during phase I of the empirical research with a strong focus on the importance of education and training. There is a need for better programmes not just at firm level but also at supply chain level where the concepts of supply chain learning and the learning supply chain have potential. As suggested by survey respondents, the provision of Government support for such initiatives could have a positive impact. The recognition issue raised by some survey respondents reflects the frustration articulated by FG3 in relation to the status (or perceived status) of supply chain professionals in organisations. Cousins et al. (2006) referred to the feeling among practitioners that they have something of value to add and the attendant “underlying frustration or perception of being largely ignored” (p. 699). This in turn relates to the predominantly operational or tactical SCM focus of many firms as discussed in section 7.2.3. Addressing this issue requires change in terms of how firms consider SCM as part of strategy formulation and implementation processes (see, for example: Christopher and Gattorna, 2005; Simchi-Levi and Kaminsky, 2003; van Hoek and Harrison, 2004). Several focus group participants and



survey respondents recognised the important role of technology – ICT in particular – and expressed concern at the challenges presented by the rapid rate of technological development. This is not only an issue at firm level as connectivity with other supply chain actors is a key issue. As pointed out by a number of survey respondents, this may be an area where Government support of some kind might be beneficial. The strong focus on green issues among the focus groups resulted in the author's *Four Fundamentals* construct being refined to incorporate a specific focus on the establishment of supply chain objectives that relate to environmental sustainability. This is clearly an issue for individual firms as well as one that could be facilitated by collaboration between supply chain actors. Possible Government support for policy initiatives in this area was again suggested by a number of survey respondents. Finally, there may be some scope – as suggested by a number of survey respondents – for policy initiatives that help companies to better understand the dynamics of those markets that they are trying to serve. This could help firms to exploit the potential afforded by easier access to global markets. It was noted in section 1.3 that the export sector in Ireland has proven remarkably resilient during the recent difficult economic period. Interestingly, this success remains largely confined to established export markets in Europe and North America (IEA, 2011). Achieving similar levels of success in rapidly growing emerging markets could be assisted by policy initiatives that provide firms with information about the dynamics of these markets.

### **7.3 Integrating Empirical Findings with the Literature**

This section integrates the findings from the author's empirical research with the existing body of scholarly knowledge in the SCM field. It does so by relating the empirical research findings to: (i) the author's *Four Fundamentals* construct (section 7.3.1); and, (ii) other relevant themes from the literature review in Chapter 2 (section 7.3.2). The former enables a description of how this construct was refined to reflect the empirical evidence, while the latter ensures that the empirical findings are linked to key contemporary issues and debates in the extant literature.

#### ***7.3.1 Empirical Findings and the Four Fundamentals***

This section relates the main findings from the three phases of the empirical work back to the extant literature using the author's *Four Fundamentals* definitional construct as a basis. This construct was developed based on the author's review of the literature

described in Chapter 2 and, therefore, provides a logical framework for relating the empirical findings to the existing body of scholarly knowledge in this field. Furthermore, the adoption of this approach facilitates a description of how the construct has been refined based on the main empirical findings.

It should firstly be noted that the need for a definitional construct was justified based on a wide variety of literature (including but not limited to: Burgess et al., 2006; Kathawala and Abdou, 2003; Stock and Boyer, 2009) as set out in detail in section 2.7. Such a need was reinforced through all three stages of the author's empirical research. There was divergence of opinion across the six interviewees in phase I in relation to what the supply chain and SCM entails. As noted in section 4.4.5, this was also the case in the earlier study of Lummus et al. (2001) and reinforces the need for definitional clarity. Discussion within all three focus groups in phase II also pointed to the need for linguistic and technical consistency. The findings from the questionnaire survey suggested that a wide range of terminology and emphases is evident in terms of how SCM is understood and applied. Indeed, analysis across the three phases of the empirical research led to the author proposing the need for a *common understanding* of SCM as a critical success factor in putting theory into practice (see section 7.2.3). It should also be noted that the development of any generic definition of the kind proposed by the author is difficult given the varying dynamics at work in different firms and across different sectors. This point was emphasised by informants across the three phases of the author's empirical work, most notably in the focus group sessions.

Figure 7.3 shows how the author's proposed definitional construct – the *Four Fundamentals* – has evolved and developed through the various phases of the empirical research described in this thesis. The literature review highlighted the need for definitional clarity in relation to SCM and informed *initial construct development*. The construct's components were described in detail in sections 2.8 to 2.11 and are summarised in Table 3.5. As noted in section 4.4, cross-mapping the responses of the phase I interviewees with the *Four Fundamentals* provides some confidence that the construct largely achieves its primary aim of concisely, yet comprehensively, defining the essence of SCM. Notwithstanding the difficulties associated with the development of a generic definition, the approach described by all interviewees was broadly in line with – and some responses virtually indistinguishable from – the essence of the construct. Thus, phase I of the author's empirical work provided *confirmation* of both

the need for, as well as the essence of, the *Four Fundamentals*. Phase II of the work provided further confirmation of the construct's validity with the great majority of the 13 key constituent concepts captured in Table 3.5 alluded to by participants across the three focus groups when describing SCM. Indeed, a number of issues not explicitly captured in the *Four Fundamentals* were highlighted by participants. Based on the analysis in section 5.4.3, the major *refinement* to the construct involved adding a specific SCM objective in relation to environmental sustainability. Based on the work of the Brundtland Commission (1987), the author defines a sustainable supply chain in this context as one that meets the needs of the present without compromising the ability of future generations to meet their own needs (see section 5.4.3). The analysis of the survey data generated during phase III of the empirical work focused chiefly on answering RQ2. However, the data did not reveal anything of significance that could be regarded as invalidating in any way the essence of the *Four Fundamentals*. In this way, the validity of the construct has been *tested* in a deductive manner based on a large data set.

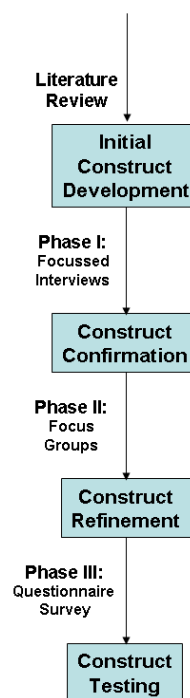


Figure 7.3: Evolution of *Four Fundamentals* Concept

The need for the adoption of more strategic approaches to SCM was highlighted as part of the identification of critical success factors and/or inhibitors to success (see section 7.2.3). The *Four Fundamentals* provides a basis for addressing this important issue by clearly positioning SCM within the overall corporate framework. As noted in section 2.8.5, the adoption of clear objectives as advocated by *Fundamental One* and the

attendant use of “margin-to-serve” thinking (see, for example, Guerriero et al., 2008) also addresses this issue by making SCM a key element of corporate marketing planning. The extant literature identifies some barriers to more effective inter-firm integration. As noted in section 2.9.5, Forslund and Jonsson (2009) suggest that lack of trust and poor communication structures can act as obstacles. This is in line with the author’s identification of the people dimension (i.e. the “soft-wiring”) and effective information management respectively as critical success factors. In view of the “understanding into action conundrum” or “implementation deficit disorder” discussed earlier, the author suggests that *Fundamental Three* is vital as it provides a rational basis for putting the philosophy of SCM – as outlined in *Fundamental Two* – into operational practice. As argued in section 2.10.5, it highlights the specific activities that need to take place, and places a strong emphasis on the need for an integrated and holistic approach to their management. In relation to *Fundamental Four*, section 2.11.6 suggested that one of the biggest manifestations of the application of SCM in recent years has involved the move away from adversarial relationships with key external suppliers towards relationships which are based on mutual trust and benefits, openness and shared goals and objectives (see, for example: Ellinger, 2002; Harland et al., 1999). This is supported by the survey findings with respondents assessing supplier relationships as relatively strong. This is compatible with respondents ranking supplier integration as the most important form of integration, as well as with their assessment that levels of integration with key suppliers are relatively high.

A final reflection on the *Four Fundamentals* construct in the light of the empirical evidence relates to the perceived relative importance of the four constituent components. The data in Figure 6.30 showed that almost three quarters of questionnaire respondents alluded to the need for different links in the supply chain to work together properly in line with the SCI concept articulated in *Fundamental Two*. This reflects the centrality of this thinking in SCM. 29.8% of respondents made reference to supply chain objectives and, more specifically, the need to optimise customer service and/or cost performance (as outlined in *Fundamental One*). Approximately one quarter of respondents alluded to the management of flows as set out in *Fundamental Three*. Just 13.7% of respondents made specific reference to the notion of relationships between actors in the supply chain. This relative lack of emphasis on relationships and their management is also reflected in the focus group findings with most groups not

specifically alluding to the key constituent components of *Fundamental Four* (see Table 5.4).

### ***7.3.2 Empirical Findings and the Literature Review***

There was recognition by informants of the main trends in the evolving SCM context across all three phases of the empirical work as discussed in section 2.2. For example, the trend towards outsourcing of supply chain functionality and the concomitant vertical disintegration of supply chain architectures was highlighted by FG2. The questionnaire survey data indicates that outsourcing of various kinds has been implemented by many firms in the context of organisational re-design. It was argued in section 2.2.5 that an increasing number of companies are coming to regard the supply chain as a source of strategic leverage. The empirical evidence suggested that this notion was widely understood by informants but not necessarily widely adopted in their companies. In general, the relatively high level of understanding of SCM among informants reflects the fact that the focus on the need for more robust approaches to supply chain design and management has sharpened in recent years (see, for example: van Hoek and Harrison, 2004; Cohen and Roussel, 2004; Sun et al., 2009).

Section 2.3 described the key lessons from SCM's historical evolution. The key lessons from this evolution (see section 2.3.4) are all recognised explicitly in the author's list of critical success factors/inhibitors to success illustrated in Figure 7.1. These include:

- (i) the need for a strong focus on customer requirements in the light of increasingly sophisticated markets and discerning customers (see, for example, Christopher, 2000);
- (ii) the need for a strong management focus if the constituent elements of supply chain functionality are to be integrated (see, for example, Fabbe-Costes and Jahre, 2007); and,
- (iii) the importance of information management as a key enabler in improving customer service performance (see, for example, Blankey, 2008).

It was further argued in section 2.3 that the work of Gattorna et al. (2003), in particular the performance/capability continuum (see Figure 2.5), provides a useful conceptual overview which mirrors SCM historical evolution in many respects. The author's interpretation of the findings from his questionnaire survey suggests that very few firms are at the "synchronisation" stage on the horizontal axis. A minority are at the "collaboration" stage, with the majority at the "process" stage and a significant number

still at the “function” stage. The implication here is that significant room for improvement remains for the great majority of firms.

Section 2.4.4 synthesised some key lessons from a number of definitions of SCM that have been developed over the years. The first lesson was that the plethora of definitions may, of itself, represent a limitation (Ross, 1998; New, 1997; Stock and Boyer, 2009). The author’s *Four Fundamentals* construct represents an attempt to address this issue. The need for effective management of relationships was an important theme in the literature – this is addressed in *Fundamental Four* of the author’s construct, as well as in several of the identified critical success factors and/or inhibitors to success in Figure 7.1. The incorporation of a focus on environmental sustainability recognises that reverse logistics and other green approaches have – and are likely to continue to – become more important (see, for example, Savitz, 2006; Srivastava, 2007).

It was argued in section 2.5.4 that the adoption of thinking captured in the various descriptions of the SCM paradigm shifts introduced in section 2.5 has the potential to have a profound impact on the nature of strategic thinking in companies of all kinds. However, the extent to which this thinking has been adopted – or even is understood – in practice is unclear. The author’s empirical work – particularly the questionnaire survey – provides a comprehensive profile of the extent of adoption in Ireland. As noted in section 7.2.2 (above), this reveals a mixed picture reinforcing the view of Leenders et al. (2002) and Christopher (1992) that “leading edge” companies may have adopted this thinking to varying degrees but that there is a need for improvement in this context across the wider business community.

Section 2.6 argued that, while there is general agreement about the lack of theory in the field of SCM, there is little consensus about how this deficiency can be best addressed. As suggested previously, the author’s *Four Fundamentals* goes somewhat further than its intended definitional focus but does not purport to represent a “unified” theory. However, it does provide the definitional clarity upon which meaningful development of such a theory appears to be predicated. In relation to the core concept of integration, the survey findings challenge the conventional wisdom that – as stated by Kotzab et al. (2011) and others – that internal supply chain orientation (SCO) is a pre-requisite to higher levels of process integration with suppliers and customers.

Section 2.7 provided a justification from the extant literature for the development of a concise and comprehensive definition of SCM, with sections 2.8 to 2.11 describing the essence of the author's proposed *Four Fundamentals* construct and section 2.12 providing some reflections on the construct based on a range of literature. Section 7.3.1 (above) describes how the construct was confirmed, refined and tested during the three phases of the author's empirical research. The role of logistics and other antecedents of SCM were described in section 2.13. The author's model of the relationship between logistics and SCM (see Figure 4.3), as an integral part of the wider *Four Fundamentals* construct, is based on the findings from phase I of the empirical work and provides some clarity on this key issue.

The author's comparison in section 2.14 of the *Four Fundamentals* with some of the practical guidelines, constructs and idealised schemas of SCM indicates that the construct goes beyond a purely definitional focus (Lummus and Vokurka, 1999; Burgess et al., 2006; Storey et al., 2006). This is reflected in some of the findings from phase II of the empirical work where several issues that go beyond the author's primary definitional focus were raised but which yet find expression in the construct. For example, the role of leadership and senior management in developing appropriate supply chain strategies was emphasised in the discussions of FG1 and FG3, as was the related issue of employee involvement and "buy-in" to the supply chain change and improvement process. As noted in section 5.4.3, these issues digress from the purely definitional focus that is the author's primary emphasis and begin to provide some insights into good SCM practice. Similarly, FG2 had a strong focus on the risk and uncertainty that is a feature of today's economic and business environment and the related need for supply chains to be responsive and dynamic. As noted in section 5.4.3, these are issues that will inevitably arise in any discussion of management practice in an economic climate that is characterised by turbulence, volatility and uncertainty but the issues that arise do not need to be specifically reflected in an SCM definitional construct. A consensus also emerged from the discussions of FG2 that dynamism in this context was more an issue of good supply chain practice rather than something that needed to be explicitly captured in a definition of SCM. FG3's discussion of the specific question as to whether high levels of internal integration were a pre-requisite for external integration is also straying away from a purely definitional focus into the realm of good SCM practice. In short, several implicit and/or explicit concepts that are

embraced by the *Four Fundamentals* provide a template of some key elements of good practice.

A useful mechanism for relating the author's findings to the extant literature is to return to the work of those authors whose work most specifically and directly informed the development of the overall RQs (see Figure 2.24). Notwithstanding the significant differences evident from the author's research amongst practitioners based on sector, firm size, ownership and respondent background, the level of understanding of core SCM concepts was generally quite high. This is at odds with the assertion of Kathawala and Abdou (2003) that a "high degree of variability" exists about what is meant by SCM. This variability, as well as the "confusion and ambiguity" (Mentzer, 2001) and the "great deal of confusion" referred to by Lambert (2004), is in general a reflection of the lack of definitional consensus that is evident in the academic literature. The author's empirical evidence suggests that a much lower level of variability, confusion and ambiguity exists amongst practitioners. This supports the views of Voss et al. (2002) and Lambert and Cooper (2000) that the development of the SCM field has to a great extent been practitioner-led, with theory largely following practice. The author's findings suggest that developments in the field have been following the practice in what Leenders et al. (2002) called "leading edge" companies. This in turn supports the view of Burgess et al. (2006) that SCM theory has been largely developed on the basis of experience in a small number of industry sectors.

However, the mixed picture that author's empirical research reveals – particularly from the questionnaire survey – strongly supports the views of Storey et al. (2006) that "predominant practice is at considerable odds with this conceptualisation", as well as those of Fabbe-Costes and Jahre (2007) in relation to the divergence between the rhetoric and reality of SCI. The view of New (1997) that a "normative tension" exists between the "is and the ought" is also borne out by the author's findings. In this context, the "is" relates to what is actually happening in practice, while the "ought" relates to what is referred to by Storey et al. (2006, p. 755) as the "relatively coherent and compelling prescriptive narrative" offered by the SCM concept. In short, the author's work supports the view that this narrative is based on the practices of a relatively small number of firms in a relatively small number of sectors but is understood – at least conceptually – across a much wider swathe of business and industry. The challenge relates to how this narrative can be embraced in a practical way by the large number of



firms for which SCM offers the potential to significantly add customer and shareholder value in the context of the rapidly changing business environment.

The author's empirical research supports the view of Skjoett-Larsen (1999, p. 51) that "nothing is more practical than a good theory" if this "understanding into action conundrum" or "implementation deficit disorder" is to be addressed. The author's work contributes to the development of such a theory through the identification of some of the CSFs and/or inhibitors to success (see Figure 7.1). This answers the call of Lambert and Cooper (2000) and Mentzer et al. (2001) for researchers to provide "guidance" to practitioners in terms of SCM implementation. Most pertinently, the author's work provides some answers to the call of Stank et al. (2011, p. 941) to "separate truth from hype" through the generation of "deeper insights into complex, multidimensional SCM concepts".

The author's work supports the view of Halldorsson et al. (2007) that there is "no such thing as a 'unified theory of SCM'" (p. 292). As noted in section 2.14, it is debatable whether it is either possible or desirable to develop such a theory. Nonetheless, the author's *Four Fundamentals* provides a basis for definitional clarity and consensus – what Stock and Boyer (2009) termed a "consensus definition" – as well as for the development of theoretical constructs that will provide a more comprehensive understanding of SCM in all its facets. Its extension beyond a purely definitional focus facilitates the latter and is in line with the call of Fawcett and Waller (2011) for theory which both resolves current challenges and takes advantage of emerging opportunities. Combined with the author's model of the relationship between SCM and logistics (see Figure 4.3) and the identified CSFs and/or inhibitors to success (see Figure 7.1), this could be further built upon in the development of new theory that facilitates a deeper and richer understanding of SCM.

## **7.4 Summary and Conclusion**

This chapter explored the author's empirical findings from the three phases of the research in a holistic and integrated manner in line with the concept of methodological pluralism. It has also linked key findings from the empirical research to the existing body of scholarly knowledge and, more specifically, to the author's *Four Fundamentals* construct.

There is no shortage of perspectives on possible future directions for SCM as an academic discipline, as well as for supply chains in practice. In this context, two insightful contributions are from Westbrook and New (2004) in relation to SCM as a discipline and Christopher (2010) in relation to the likely characteristics of the successful supply chains of the future. In a speculative manner, Westbrook and New (2004) suggested four possible futures for SCM. The first possibility (“marginalisation”) is that SCM has no future. The second possible future (“realisation”) involves an increase in the practical adoption of SCM thinking, with SCM becoming more reality than rhetoric. The third (“rationalisation”) involves continuing rational development of the various elements of SCM. The final proposed future is labeled “canonisation”. As the authors note:

This term refers here not to an elevation to the company of saints .... The sense of canonisation here is one of entering the canon, the canon of approved modes of thinking about business (Westbrook and New, 2004, p. 284).

Christopher (2005) highlights the shift from mass production and mass marketing (“yesterday’s model”) to mass customisation (MC) and one-to-one marketing (“tomorrow’s model”). He goes on to describe “seven major business transformations” (p. 288), all of which have significant implications for the effective management of the supply chains of the future. One of these transformations is that from stand-alone competition to network rivalry. In this context, he notes that:

The companies that will be most successful in this era of network competition will be those that are best able to utilise the resources and competencies of other partners across the network (Christopher, 2010, p. 286).

Whilst there is evidence throughout this thesis of significant differences in the level of diffusion of contemporary SCM concepts and practices across different sectors, the author’s findings support the belief that SCM is unlikely to be either completely marginalised or “canonised” in this era of network competition. Rather, further adoption of existing theory in practice (“realisation”) and continuing development of SCM’s constituent elements (“rationalisation”) is more likely. This is in line with the work presented throughout this thesis. Indeed, the author’s work supports the development of SCM thinking (i.e. “rationalisation”), which in turn makes its adoption in practice (i.e. “realisation”) more likely.

Chapter 8 goes on to summarise the main contributions of the research described both in terms of the scholarly body of knowledge and methodologically, as well as to identify key implications of the findings for practitioners and scholars.

## CHAPTER 8

### GENERAL CONCLUSIONS, IMPLCATIONS AND SUGGESTIONS FOR FURTHER WORK

#### 8.1 Introduction

This final chapter summarises the main contributions of the research described in this thesis (section 8.2), both in terms of the scholarly body of knowledge and methodologically. It goes on to highlight some key implications (section 8.3), for both supply chain practitioners and policy makers. The limitations of the work are highlighted in section 8.4, leading directly to a number of suggestions for future potentially fruitful research avenues in the field.

#### 8.2 Contribution of the Research

This section summarises the main contributions of the research described in this thesis, both to the existing scholarly body of knowledge in the field (8.2.1) and methodologically (8.2.2).

##### 8.2.1 Knowledge Contribution

The development of the author's four research questions (RQs) was explained in section 2.15.4 based on the comprehensive literature review set out in Chapter 2. The fundamental aim of this research was to disentangle the rhetoric from the reality in relation to SCM adoption in practice in the specific context of Ireland. The major contribution of the research lies in the insights into these questions generated from the three phases of the empirical work. The integrated and holistic discussion of these findings in section 7.2 (above) highlights these insights as they relate to each of the four RQs. As noted in section 3.3.7, the author's adoption of the *Four Fundamentals* construct as a frame of reference, as well as the use of combinatory methodological approaches, was aimed at ensuring that the work described in this thesis:

1. Is of practical value to practitioners and policy-makers by providing a detailed understanding of the current SCM landscape in Ireland; and,
2. Contributes in a meaningful way to the further development of critical SCM theory across the range of domains addressed.

In line with this, the main contributions of the research described in this thesis to the scholarly body of knowledge in the SCM field relate to the:

1. Development of a profile of SCM understanding and adoption by firms in Ireland (RQ1 and RQ2), as well as of the related critical success factors and/or inhibitors to success (RQ3); and,
2. Development and refinement of the *Four Fundamentals* definitional construct.

This is in line with two of the possible futures for SCM articulated by Westbrook and New (2004) and introduced in section 7.4. The former provides insights into the extent to which SCM theory has been adopted in practice by firms in Ireland (i.e. “realisation”); the latter supports the development of new thinking in the SCM field (i.e. “rationalisation”). In addition to the above and in line with the focus of RQ4 (see section 7.2.4), some managerial and policy implications have been identified based on a synthesis of the empirical findings. This point will be returned to in section 8.3.

#### Profile of Understanding and Adoption of SCM in Ireland

As noted in section 2.15, the extant literature suggests that there is confusion and ambiguity regarding exactly what SCM entails, as well as evidence that practice “is at considerable odds with” theoretical conceptualisations (Storey et al., 2006, p. 755). It was further noted that the extent to which SCM thinking has been adopted is unclear apart perhaps from in a few leading edge companies (Christopher, 1992; Leenders et al., 2002). This is particularly true in an Irish context where a very limited number of studies have been undertaken to date. This dearth of studies is somewhat surprising given the importance attached to supply chain issues in national economic and industrial policy (see, for example, Forfas, 2012). A study conducted by the National Institute for Transport and Logistics (NITL, 2005) formed the basis of a couple of academic papers (Sweeney et al., 2008; Huber and Sweeney, 2007). A more recent study was carried out by a market research company<sup>39</sup> in conjunction with Accenture (Amarach, 2012). However, both studies are very limited in scope and were aimed at addressing quite a narrow range of issues. They both used convenience sampling approaches thus limiting the validity of the findings.

The author’s empirical work provides insights into the level of understanding of SCM in Ireland, with the questionnaire survey also providing a comprehensive profile of the extent of adoption in Ireland. The key message from this is that, while levels of

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<sup>39</sup> Amarach Research (see Amarach, 2012)

understanding appear to be quite high, the picture is more mixed in relation to actual adoption (see sections 7.2.1 and 7.2.2). As noted in section 7.2.2, this suggests that an “understanding into action conundrum” or an “implementation deficit disorder” exists. The critical success factors and/or inhibitors to success derived from the empirical work (see section 7.2.3) facilitate more informed decision making by practitioners and policy makers thus providing a basis for addressing this challenge (see section 8.3).

As noted in section 2.15.3, many previous empirical studies have had quite a narrow focus. Given the holistic and integrative nature of SCM, the author’s work deliberately took a broad view. This ensures that the insights generated into the various RQs, as well as the development and refinement of the *Four Fundamentals* construct (see below), are based on as wide a range of perspectives as possible.

#### Definitional Construct

The need for SCM definitional clarity is a strong feature of the extant literature and is a key theme in the author’s literature review (see, in particular, section 2.7). This requirement is put perhaps most succinctly by Stock and Boyer (2009, p. 690) in their statement that “an integrated definition of SCM would greatly benefit researchers’ efforts to study the phenomenon of SCM and those practitioners attempting to implement SCM”. The author contends that his *Four Fundamentals* construct squarely addresses this requirement. It was developed based on a wide range of literature and is compatible with “important components of an integrated definition” proposed by Stock and Boyer (2009, p. 690). The need for such a construct is evident from phases I and II – and, albeit to a lesser extent, from phase III – of the author’s empirical work.

The empirical findings enabled the construct to be refined with: (i) the development and incorporation of a model of the relationship between SCM and logistics based on the focussed interviews of phase I; and, (ii) the incorporation of a sustainability focus into the construct based on the focus groups of phase II. The former can be regarded as an integral part of the wider *Four Fundamentals* construct and provides some clarity on this key issue. The latter represents the increasing need for the adoption of a greener perspective. The validity of the construct is confirmed by the data collected during all three phases of the empirical work.

The difficulties associated with the development of a generic definition were clear from the literature review and these challenges were reinforced by informants during the focussed interview and focus group phases of the empirical work. Notwithstanding these difficulties, the findings suggest that the author has succeeded in his aim of developing a construct that concisely, yet comprehensively, defines the essence of SCM, and that is intelligible irrespective of functional background, business sector, geography or level of seniority. However, to maximise the value of the construct in practice it needs to be interpreted in a thoughtful way by practitioners so that the particular dynamics and strategic imperatives of their industries are considered and appropriately incorporated. For example (and as noted in section 2.11.6), there can be no “one size fits all” approach in terms of determining the nature of internal and external customer/supplier relationships. There are many possible relationship forms and choosing the right ones in specific situations is the key to *Fundamental Four*. The same is true in terms of how the other elements of the construct are interpreted and used.

As noted in section 2.12, Fawcett and Magnan (2002, p. 359-360) suggested that “not only do SCM practices lack cohesion and visibility but supply chain strategies lack specificity and reach” as a result of the wide variety of SCM definitions. The author’s construct, along with the model of the relationship between SCM and logistics (Figure 4.3) and the CSFs/inhibitors to success (see Figure 7.1), respond to the calls of several scholars (notably: Lambert and Cooper (2000); Mentzer et al. (2001); Fawcett et al., 2011) for researchers to provide “guidance” to practitioners in terms of SCM implementation. In this way, the author’s work also makes a contribution to the “cohesion and visibility” of practices, as well as to the “specificity and reach” of supply chain strategies.

### **8.2.2 Methodological Contribution**

The main contributions from a methodological and analytical perspective relate to the adoption of a multi-paradigmatic positionality and the associated use of triangulation and methodological pluralism. The latter raises specific issues in relation to emerging (or dynamic) research designs. The relative lack of use of focus groups in previous SCM research has resulted in a number of elements of good practice in the use of this method being suggested by the author. Finally, the author’s analysis of the data collected during phase III of the empirical research made use of a range of analytical

techniques not often used in the research described in the extant literature. The following sections describe some of these contributions and reflect on the author's experience in relation to each issue.

### Research Philosophy and Positionality

As noted in section 3.2.2, the ontological and epistemological assumptions of researchers impact strongly on the way in which research is carried out. The author's experience through the three phases of the empirical work suggests that the former is particularly important given the array of language and metaphors that are often used to explain supply chain concepts. The author's use of a two-stage filtering process in the analysis of phase I interview transcripts is an example of the attention to detail that is required in this context. As noted in section 3.2.5, there has been extensive debate about the relative merits of "pure" positivism and "pure" interpretivism and the extent to which positionality in paradigmatic terms impacts upon the research process. Robson (2002) refers to this debate as "so-called 'paradigm wars' endemic" (p. 43). The majority of SCM and logistics research is "rightly or wrongly, primarily populated by quantitative research viewed through a positivist lens" (Mangan et al., 2004, p. 575). In relation to the research described in this thesis, the author's approach was based on his assertion that answering the research questions required that a range of philosophical perspectives be adopted to ensure that the issues being studied are explored holistically and that the disadvantages associated with the adoption of either purely positivist or interpretivist positions are avoided. On reflection, he feels that this assertion was accurate and that an approach based purely on either end of the positionality spectrum could not have addressed the questions in a meaningful way. In this context, his experience is fully in agreement with the views of Frankel et al. (2005) who suggested that "good research is good research" (p. 205) and that in applied fields (such as SCM) multiple kinds of good research should be used and good examples of the application of different paradigms provided. The author calls on SCM researchers to consider the benefits of multi-paradigmatic approaches as a means of expanding and enriching our understanding. It is also clear from the empirical research that the development of a better understanding of issues of philosophy and positionality is important if researchers are to more effectively communicate with each other. As noted in section 3.2.6, failure to communicate is often a result of the varying assumptions held by researchers about their subject (see Mangan et al., 2004; Morgan and Smircich, 1980).



### Triangulation and Methodological Pluralism

As noted above, answering the author's research questions required that a range of philosophical perspectives be adopted. This in turn drives the methodological approach adopted – i.e. one that explores the research questions through an appropriate combination of quantitative and qualitative methods. This is the basis of methodological pluralism and adopts the concept of triangulation. The author's experience suggests that the RQs posed could not have been answered using either a purely qualitative or a purely quantitative approach. Similarly, the combined use of inductive and deductive approaches is the only way in which meaningful insights into the RQs could have been generated. In section 3.3.7, the author emphasised that the use of multiple-method approaches based on the triangulation principle is not in itself what methodological pluralism is about. Rather, it is concerned with the effective use of a range of appropriate methods as part of an integrated research design. The various methodological approaches need to complement each other as integral elements of a cohesive overall strategy. The author's experience of carrying out the data collection and analysis suggests that the words “integrated” and “cohesion” are vital in this regard. As noted in section 3.5, each phase each phase of the empirical research aimed to address one or two of the RQs specifically (as shown in Figure 3.5) but the research was carefully designed so that all phases could potentially contribute to the generation of insights into all RQs. The important point is that the cross-phase analysis be carried out in an integrated and cohesive manner (see section 7.2.1). Figure 8.1 attempts to illustrate this with specific reference to the role of different methods in enhancing validity and reliability.

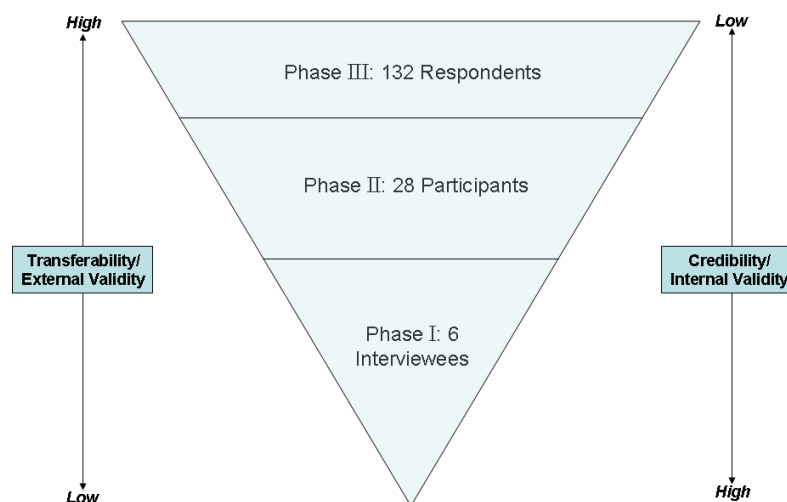


Figure 8.1: Complementarity of Methods

Phase I provided the author with relatively deep insights but the small number of interviewees meant that the findings were quite narrow and, therefore, difficult to generalise. In other words, the credibility (or internal validity) was relatively high, while the transferability (or external validity) was relatively low. Phase II begins to add somewhat more breadth as the number of informants increases but the depth of understanding that is developed reduces to some extent. Finally, the questionnaire survey provided considerable breadth based on the 132 respondents, thus making generalisability possible. In other words, the credibility (or internal validity) was relatively low and the transferability (or external validity) relatively high. In this way, the author's research design – based on methodological pluralism and the use of multiple methods – was capable of generating perspectives that were both credible and transferable in a way which would not have been possible had a single method been used.

#### Emerging Research Designs

This concept refers to the fact that when a variety of factors are being studied simultaneously new issues will emerge during the research process. In other words, the process is dynamic. While attention to detail is vital in designing any robust piece of research there has to be a recognition that a degree of fluidity has to be built into the overall approach. There are many examples of this in the author's empirical work. For example, the holding of four focus groups was planned for phase II of the empirical work in the initial research design. However, just three were conducted based on the related concepts of data and theoretical saturation. Another aspect of emerging or dynamic research design is based on the notion that the various phases in the research inform each other. One example of this from the author's empirical work related to the refinement of the *Four Fundamentals* construct to incorporate an environmental dimension based on the focus group findings in phase II.

#### The Use of Focus Groups in SCM Research

The formal use of focus groups in SCM research is a relatively recent phenomenon. As noted in Chapter 3, the author found the recent paper by Sanchez Rodrigues et al. (2010) quite useful in terms of planning the focus group sessions. On reflection, the composition of the focus groups – i.e. an attempt to combine the best elements of homogeneous and heterogeneous groups – worked well and provided an effective balance in terms of the discussions that took place. In terms of group size, the author's

research used groups of different sizes and each delivered a different dynamic. These different dynamics facilitated the generation of a range of different insights. The author's experience suggests that the role of the facilitator is crucial in managing the larger groups but that need not be a major difficulty in practice. One final point of detail in focus group execution relates the recording of discussions. Fully understanding the implications of the various discussions would not have been possible without a transcript. The author's experience suggests that any initial participant misgivings in relation to recording the sessions largely disappear once the discussion is underway. Incidentally, the time-consuming nature of transcribing focus group sessions should be recognised by researchers planning focus group sessions.

### Analytical Techniques

As noted earlier, few existing SCM studies employ some of the analytical techniques used in phase III of the present study. For example, the use of correspondence analysis factor maps of the cross tabulations was useful in illustrating the relationships between variables. In particular, this allowed the factors that contribute most strongly to statistically significant relationships between demographic and other variables to be identified in the absence of well defined a priori expectations as to the nature of such relationships. The contingency approach also proved useful in compiling the results of the various statistical tests that were carried out by the author (see, for example, Figure 6.97). This allowed the key dependencies to be viewed in a single model.

## **8.3 Implications**

This section highlights some key implications from the author's research, both for supply chain practitioners (8.3.1) and for policy makers (8.3.2).

### ***8.3.1 Managerial Implications***

The implications for supply chain professionals at all levels from this research are many and varied. The main ones are highlighted in this section with specific reference to the critical success factors and/or inhibitors to success illustrated in Figure 7.1.

### Firm Demographics

Differences in practices among firms of different sizes and in different sectors are to be expected. In relation to sector, the competitive pressures that have resulted in the

relatively early adoption of SCM by firms in certain sectors are likely to become prevalent across other sectors as competition intensifies over time. Interestingly, the evidence suggests that the practical experience upon which SCM theory is based is often confined to a relatively small number of key industry sectors. For example (and as pointed out in section 2.15.2), Burgess et al. (2006, p. 707) observed that “a handful of industry sectors” accounted for the majority of the literature with consumer goods retailing, IT and automotive to the fore. Over time it is likely that more and more sectors will be impacted by similar competitive pressures and that SCM adoption will become more of a priority as a result. In terms of size, the author notices two countervailing pressures at work. Firstly, larger firms are more likely to have access to the financial and human resources necessary to develop and implement robust supply chain strategies. Secondly, smaller firms may find the core SCM concept of integration somewhat less relevant than their larger counterparts. The organisational fragmentation that precipitated SCM’s origins is more likely to be a feature of the latter. Nonetheless, the lessons from all components of the author’s *Four Fundamentals* construct found resonance amongst key informants from smaller firms during phases I and II of the empirical research suggesting that they have a potentially important role to play in the improvement processes of SMEs.

### Relative Power

It has long been recognised that the relative power of actors in supply chains has a strong impact on the dynamic of the chain as a whole. For example, the long established five forces model associated with Michael Porter is largely based on this notion (Porter, 1980). The key for supply chain professionals is to recognise where their firm fits in the wider supply chain and to ensure that supply chain strategies and plans are based on this. Indeed, SCM thinking forces managers to recognise that their companies are just one link in a bigger network of actors and to think beyond the boundaries of their own firms.

### Need for Common Understanding

The various calls in the literature prompted the development of the author’s *Four Fundamentals* construct. This construct, along with the author’s proposed model of the link between SCM and logistics, has been specifically developed to facilitate the collaborative approaches necessary for the improvement of overall supply chain capability and performance. In arguing the need for a unified definition in section 2.7,

the author noted that such a definition was aimed primarily at a practitioner audience with precisely these challenges in mind. These and other related issues have been discussed extensively elsewhere in this thesis.

### Customer Focus

The supply chain's ultimate objective – as recognised in *Fundamental One* – is to create value. It is impossible, therefore, to think in any meaningful way about SCM without having a strong focus on the evolving requirements of customers. This concept has long been recognised in the SCM literature. The axiom that “the supply chain begins and ends with the customer” recognises that – as illustrated in Figure 2.8 – an understanding of customer requirements sets the specification for supply chain design and management.

### Managerial Focus

As noted in section 7.2.3, the focus of managers has a major impact on the extent to which SCM is adopted in firms. The author's findings suggest that managers need to adopt a more strategic view which recognises the importance of the people dimension. In line with the views of FG3 in particular, SCM needs to be proactive with a concern for building supply chain capability in advance of the requirement (i.e. rather than being primarily about reacting to periodic crises). The importance of the people dimension simply recognises that the core SCM concept of integration is predicated on the building of relationships, and that relationships are primarily about people. An overview of some of the main elements of the people dimension is provided in section 2.11.5.

### Key Enablers

The final cluster in Figure 7.1 relates to three of the key enablers of the supply chain improvement process. As noted in section 2.2, the context and environment within which supply chains operate have become more complex in recent years. The key enablers, particularly ICT, have also been evolving at a rapid rate. The net result of these and other factors is that the role of the supply chain professional at all levels has become more knowledge- and skill-intensive. This has major implications for the development of appropriate education and training programmes. The key issue for practitioners is to develop planned approaches to SCM education and training that ensure that the necessary knowledge and skills are in place as and when required. The importance of information flow management and ICT, as well as of supply chain

performance measurement, has been the subject of much debate in the literature and features quite strongly in the *Four Fundamentals* (see sections 2.10.4 and 2.9.4 respectively). The author's empirical evidence reinforces their importance in putting SCM theory into effective practice in the increasingly complex economic and business environment.

### **8.3.2 Policy Implications**

As with managerial implications, the implications for policy makers from this research are many and varied. The main ones are highlighted in this section with specific reference to the possible interventions that were suggested in an Irish context by survey respondents as set out in Table 7.1 (above).

#### Education

Despite recognition of the importance of SCM and logistics as part of the Government's economic recovery plan – based largely on export-driven growth – there is little support for education that is aimed at improving the knowledge and skill base of the supply chain community. This issue could be addressed by bringing together the key stakeholders (providers and customers) with a view to developing a more cohesive approach in this area. In particular, education and training provision needs to be based fundamentally on supporting higher levels of integration between actors rather than accentuating fragmentation.

#### Technology

The rapid rate of development of technology in recent years makes it difficult for firms, particularly SMEs, to even keep abreast of technology and its potential to contribute to supply chain improvement. The work of Irish public bodies in this area has been negligible to date. Bodies such as Enterprise Ireland, whose remit is concerned with the development of indigenous enterprise (often SMEs), have a potentially important role in this regard.

#### Environment

The impact of supply chain activities on environmental degradation is well documented. Its increasing importance in an SCM context was evident from the author's empirical research and resulted in the *Four Fundamentals* construct being refined to incorporate an environmental focus. However, firms appear to be unsure as to how this issue can be

best addressed. For example, none of the survey respondents implemented any specific initiative in this area over the last two years and just two firms had plans to do so (see section 6.4.6). Various Government departments and agencies are well placed to provide practical support in this area both in terms of awareness creation and through the provision of financial support for appropriate initiatives.

#### Market Information

As noted previously, the markets that firms are serving have become more complex and customers have become more discerning. In addition, the changes which have taken place in recent years in the international economic and business environment have created opportunities for Irish firms beyond their traditional primary markets in the UK, the EU and North America. However, the exploitation of these opportunities requires a more detailed understanding of the dynamics of these markets. This is an area where practical support could be provided for firms in the context of the national export-driven growth strategy.

### **8.4 Research Limitations and Suggestions for Further Work**

The main limitations of the work are highlighted in this section. This leads directly to the identification of a number of potentially fruitful avenues for future research in the field.

1. The author adopted a methodologically pluralist approach using focussed interviews, focus groups and a questionnaire survey. This allowed useful insights into the four RQs to be generated but did not allow the questions to be completely answered in a definitive manner. Indeed the nature of the questions is such that they can probably never be answered entirely definitively. Nonetheless, the expansion of the research design to incorporate case studies, grounded theory and action research has the potential to add significantly to the author's findings. While the use of case studies in SCM research has increased in recent years, the need for more case study analysis in the field has been emphasised by several scholars. Chow et al. (1994), as a result of some of the inherent limitations of survey-based research, invited journal editors to encourage case study methods in logistics and SCM research. Gammelgaard (2003), noting the lack of case approaches in logistics research, analysed a selection of 17 case studies from leading logistics/SCM journals to derive a framework for understanding and

conducting case analysis. Juga (2003) argued that if case studies in logistics research are built on solid theoretical bases they can be considered a valuable tool in stimulating the dialogue between practitioners and academics and in promoting improvement in logistics competencies. Similarly, the use of grounded theory (see section 3.3.6) and action research (see section 3.3.7) has the potential to further enhance our understanding of the critical success factors and/or inhibitors to the effective adoption of SCM theory in practice.

2. The author's research (particularly that which relates to RQ1 and RQ2) provides a profile of SCM understanding and adoption in Ireland at a particular point in time. Different methodological approaches make it difficult to directly compare the author's finding with those of previous studies. It would be useful, therefore, for longitudinal studies to be put into place so that a barometer of progress over time could be developed.
3. The author's focussed interviews in phase I were based on the work of Lummus et al. (2001). However, direct comparison with the earlier study is difficult, not least because the exact methodology employed in that study is not set out in Lummus et al. (2001) with sufficient clarity or detail. There have been many calls for replications in the literature (see, for example: Evanschitzky et al., 2007; Neuliep, 1991) but their execution depends on the clarity of the research design and methodology. In relation to replication, the author's work was carried out in Ireland. It would be interesting to replicate the study in other countries with a view to identifying points of similarity and points of divergence. The detailed description of the author's research design in Chapter 3 allows such a replication to be undertaken.
4. The author's research design incorporated two specific components where horizontal supply chains were studied (i.e. the manufacturing/3PL/retailer configuration in the focussed interviews and the food industry chain that comprised part of FG2). While the insights generated from these two components were useful, the amount of work carried out by the author in this regard was very limited. There is great potential to build on the insights generated by the current research by establishing focus groups that represent horizontal chains. For example, a group that was specifically designed with representatives from the various links in the external supply chain depicted in Figure 2.13 (e.g. suppliers, manufacturers, distributors, retailers, consumers) that was either industry-specific or more general would provide useful information that would help to answer RQ3



and RQ4 more comprehensively. Other variations on this theme could include, for example, detailed case studies with key informants from the case companies also participating in focus group sessions.

5. The author's definition of the population of firms to be studied in the questionnaire survey was reduced from over 200,000 to 11,445 as a result of the exclusion certain sectors and of micro enterprises. As noted in section 3.8, there is an argument for regarding every firm as part of the population given that all firms are part of a wider supply chain network. Such an approach is fraught with difficulty – particularly in terms of identifying an appropriate sampling frame – but would likely provide insights that had a wider applicability. The author suggested in section 3.8.2 that a separate study be conducted of NACE A (i.e. agriculture, forestry and fishing) firms. It is similarly suggested that a study be carried out in NACE F (i.e. construction). Serious consideration was given to inclusion of this sector in the current study given that there is evidence that it is becoming more aware of the potential role of SCM. For example, Vrijhoef and Koskela (2000) noted that:

The generic methodology offered by SCM contributes to better understanding and resolution of basic problems in construction supply chains, and gives directions for construction supply chain development (p. 169).

NACE A and F are large sectors in the Irish economy and represent over half of the total number of firms in the country. However, the current limited coverage of these categories could make the identification of an appropriate sampling frame problematic.

6. Finally and as alluded to in section 7.3.2, several implicit and/or explicit concepts that are embraced by the *Four Fundamentals* construct provide a template of some key elements of good practice. The construct could, therefore, be further built upon with a view to contributing to the development of new theory that facilitates deeper and richer understanding of SCM.

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# APPENDIX 1: SELECTED SCM LITERATURE

Source: Chen and Paulraj (2004b)

Main area	Subarea	Reference
Strategic purchasing		Aguillar (1992) Ammer (1989) Carlisle and Parker (1989) Carr and Smeltzer (1997, 1999) Carr and Pearson (1999, 2002) Carter and Narasimhan (1996) Ellram and Carr (1994) Fearson (1989) Freeman and Cavinato (1990) Fung (1999) Gadde and Hakansson (1993) Heidi and John (1990) Keough (1994) Krause (1999) Krause <i>et al.</i> (2001) Lamming (1993) Landeros and Monczka (1989) Morris and Calantone (1991) Pearson and Gritzmacher (1990) Pearson <i>et al.</i> (1996) Reck and Long (1988) Shin <i>et al.</i> (2000) Spekman and Hill (1980) Spekman <i>et al.</i> (1994) Young and Varble (1997) Watts <i>et al.</i> (1992)
Supply management	communication	Ansari and Modarress (1990) Bhote (1987) Carr and Pearson (1999) Carter and Miller (1989) Dobler <i>et al.</i> (1990) Galt and Dale (2001) Giunipero (1990) Hahn <i>et al.</i> (1990) Krause (1999) Lascelles and Dale (1989) Newman and Rhee (1990) Turnbull <i>et al.</i> (1992)
Supply management	supplier base reduction	Bozarth <i>et al.</i> (1998) Burt (1989) De Toni and Nassimbeni (1999) Dyer (2000) Hahn <i>et al.</i> (1986) Handfield (1993) Helper (1991) Kekre <i>et al.</i> (1995) Mohr and Spekman (1994) Manoocheri (1984) Morgan (1987) Newman (1988a, b) Newman (1989) Offodile and Arrington (1992) Pilling and Zhang (1992) Raia (1988, 1993) Richardson (1993) Russell and Krajewski (1992) Shin <i>et al.</i> (2000) Spekman (1988) St. John and Heriot (1993) Trevelen (1987)
Supply management	long-term relationships	Carr and Pearson (1999) Choi and Hartley (1996) Christopher (1992) Cooper and Ellram (1993) De Toni and Nassimbeni (1999) Dyer (1997, 2000) Hahn <i>et al.</i> (1983) Hakansson (1987) Helper (1991) Helper and Sako (1995) Hines (1994) Johnston and Lawrence (1990) Kotabe <i>et al.</i> (2003) Lamming (1993) Landeros and Monczka (1989) Lorenzoni and Ornait (1988) Macbeth and Ferguson (1994) Nishiguchi (1994) Sabel <i>et al.</i> (1987) Slack (1991) Stuart (1993) Womack <i>et al.</i> (1991)
Supply management	supplier selection	Anderson and Narus (1990) Bailey <i>et al.</i> (1994) Baxter <i>et al.</i> (1989) Choi and Hartley (1996) Croom (1992, 2001) Dempsey (1978) Dickson (1966) Dyer (1997) Ellram (1990) Helper (1991) Ittner <i>et al.</i> (1999) Lewis (1995) Manoocheri (1984) Narasimhan (1983) Treleven (1987) Weber <i>et al.</i> (1991) Willis and Huston (1989)
Supply management	supplier certification	American Quality Foundation and Ernst and Young (1998) Baiman <i>et al.</i> (1998) Carr and Ittner (1992) Ellram and Siferd (1998) Grieco (1989) Gibson <i>et al.</i> (1995) Heide and John (1990) Inman and Hubler (1992) Ittner <i>et al.</i> (1999) Jancsurak (1992) Larson and Kulchitsky (1998) Lockhart and Ettkin (1993) Maass <i>et al.</i> (1990) Murphy (1992) Schneider <i>et al.</i> (1995)
Supply management	supplier involvement	Aleo (1992) Birou and Fawcett (1994) Burt and Soukup (1985) Burton (1988) Cayer (1988) Clark (1989) Clark and Fujimoto (1991) Dowlatsahi (1998, 2000) Eisenhardt and Tabrizi (1994) Hakansson and Eriksson (1993) Helper (1991) Hines (1994) Karmath and Liker (1994) LaBahn and Krapfel (1994) Lamming (1993) Mabert <i>et al.</i> (1992) Naumann and Reck (1982) Primo and Amundson (2002) Ragatz <i>et al.</i> (1997, 2002) Shin <i>et al.</i> (2000) Swink (1999) Wynstra and Pierick (2000) Wynstra <i>et al.</i> (2000)
Supply management	cross-functional teams	Burt (1989) Burt and Doyle (1993) Davidow and Malone (1992) Deeter-Schmelz and Ramsey (1995) Drew and Coulson-Thomas (1997) Ellram and Pearson (1993) Hahn <i>et al.</i> (1990) Handy (1990) Hastings (1993) Helfert and Gemunden (1998) Helfert and Vith (1999) Hines (1994) Krause and Elram (1997) Moon and Armstrong (1994) Narus and Anderson (1995) Smith and Barclay (1993)
Supply management	trust and commitment	Dion <i>et al.</i> (1992) Dyer (1997) Handfield and Bechtel (2002) Heidi and John (1990) Hill (1990) Kumar (1996) Lee and Billington (1992) Nooteboom <i>et al.</i> (1997) Spekman <i>et al.</i> (1998) Zaheer and Venkatraman (1995) Zaheer <i>et al.</i> (1998)
Logistics integration	general	Caputo (1996) Caputo and Mininno (1998) La Londe (1983) Langley and Holcomb (1992) Vollman <i>et al.</i> (1997)
Logistics integration	internal integration	Appley and Winder (1977) Ballou <i>et al.</i> (2000) Bowersox and Daugherty (1987) Bowersox <i>et al.</i> (1992) Cespedes (1996) Ellinger (2000) Gray (1989) Griffin and Hauser (1996) Kahn (1996) Kahn and Mentzer (1996) Kent and Flint (1997) Kingman-Brundage <i>et al.</i> (1995) Liedtka (1996) McGinnis and Kohn (1990) Moenaert <i>et al.</i> (1994) Rinehart <i>et al.</i> (1989) Schrage (1990) Souder (1987) Stank <i>et al.</i> (1999) Stolle (1967) Tjosvold (1988)
Logistics integration	external integration	Armistead and Mapes (1993) Ballou <i>et al.</i> (2000) Berry <i>et al.</i> (1994) Bowersox (1997) Bowersox and Closs (1996) Bowersox <i>et al.</i> (1988) Busch (1988) Christopher (1994) Cooper <i>et al.</i> (1997b) Dolan (1987) Drew and Smith (1995) Fox (1991, 1992) Greis and Kasarda (1997) Gustin <i>et al.</i> (1995) La Londe <i>et al.</i> (1970) La Londe and Powers (1993) Lambert and Stock (1993) Larson (1994) McGinnis and Kohn (1990) Morash (1990) Morash <i>et al.</i> (1997) Stock (1990) Stock and Lambert (1992) Stock <i>et al.</i> (1998, 2000) Towill (1997) Vonderembse <i>et al.</i> (1995) Walton and Maruchek (1997) Wasik (1992)
Supply network coordination	general	Chandra and Fisher (1994) Ernst and Pyke (1993) Forrester (1958, 1961) Goyal (1988) Lau and Lau (1994) Lee <i>et al.</i> (1997)
Supply network coordination	survey articles	Beamon (1998) Erenguc <i>et al.</i> (1999) Sahin and Robinson (2002) Thomas and Griffin (1996)
Supply chain performance	financial	Beamon (1999) Chen and Lee (1995) Dixon <i>et al.</i> (1990) Eccles and Pyburn (1992) Geanuracos and Meiklejohn (1993) Hall (1983) Hofer (1983) Johnson and Kaplan (1987) Kaplan (1988) Medori <i>et al.</i> (1995) Neely (1998) Neely <i>et al.</i> (1995) Skinner (1971) Tarr (1995) Venkatraman and Ramanujam (1987)
Supply chain performance	operational	Beamon (1999) Chen and Lee (1995) Eccles and Pyburn (1992) Medori (1998) Medori <i>et al.</i> (1995) Medori and Steeple (2000) Neely (1998)
Supply chain performance	supply chain	Beamon (1999) Bello and Gilliland (1997) Fawcett and Clinton (1996) Gunasekaran <i>et al.</i> (2001) Handfield (1995) Handfield and Pannesi (1992) Hendrick (1994) Jayaram <i>et al.</i> (1999) Kaplan and Norton (1996a, b) Roth and Miller (1990) Safizadeh <i>et al.</i> (1996) Stalk and Hout (1990) Tersine and Hummingbird (1995) Tunc and Gupta (1993) Vickery <i>et al.</i> (1995)

## APPENDIX 2: SCOR MODEL

Source: Supply Chain Council (2005)

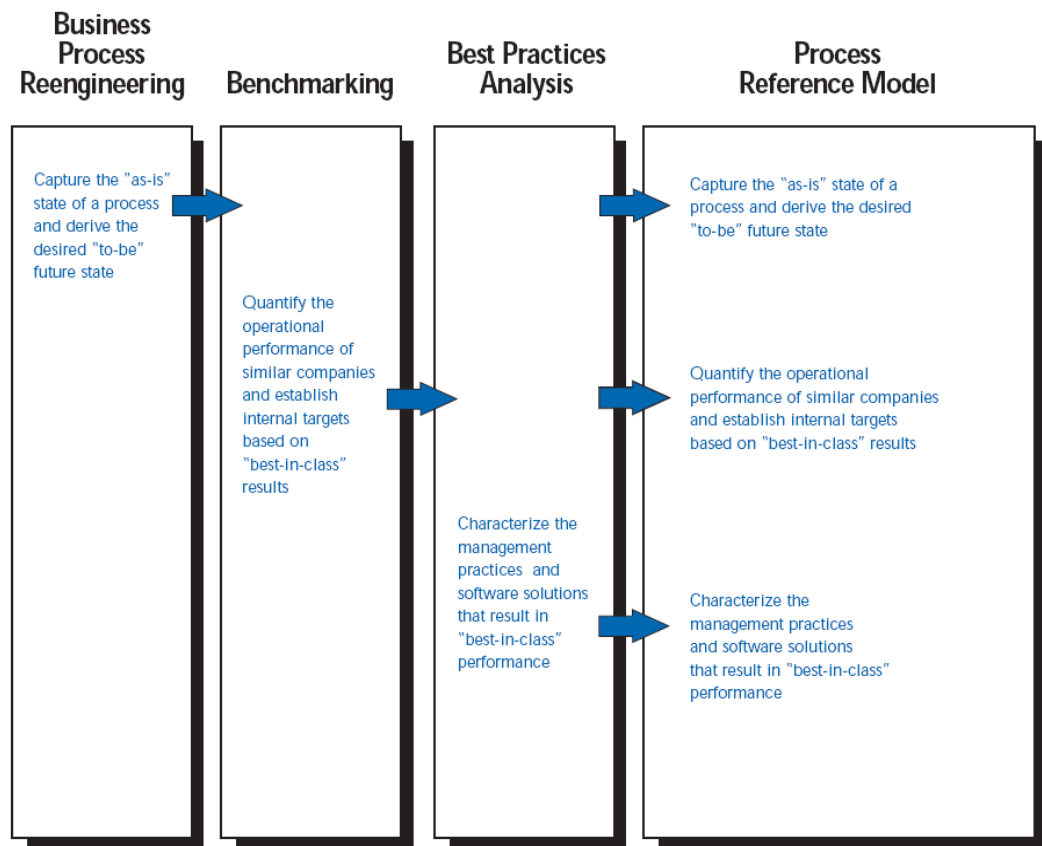


Figure 1: SCOR Process Reference Model Elements

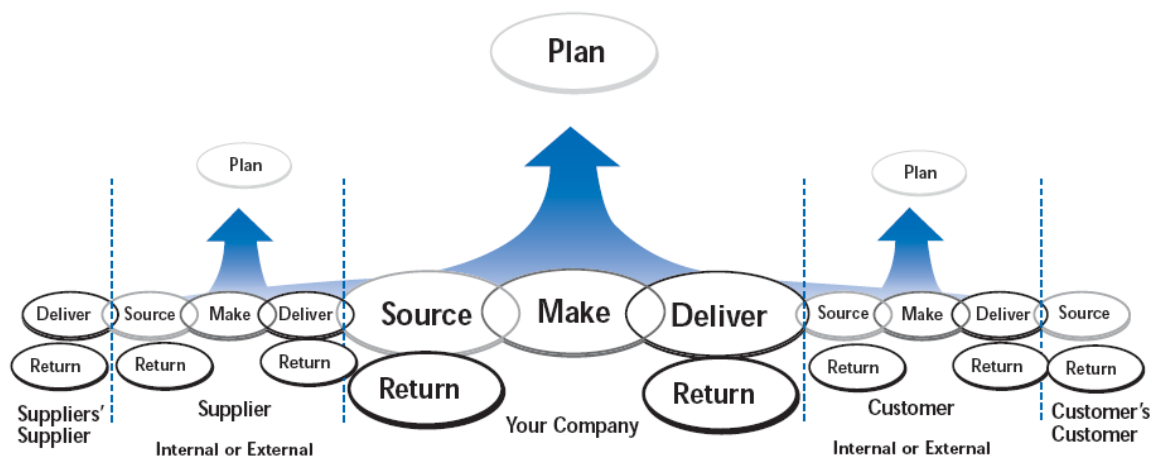


Figure 2: SCOR Management Processes



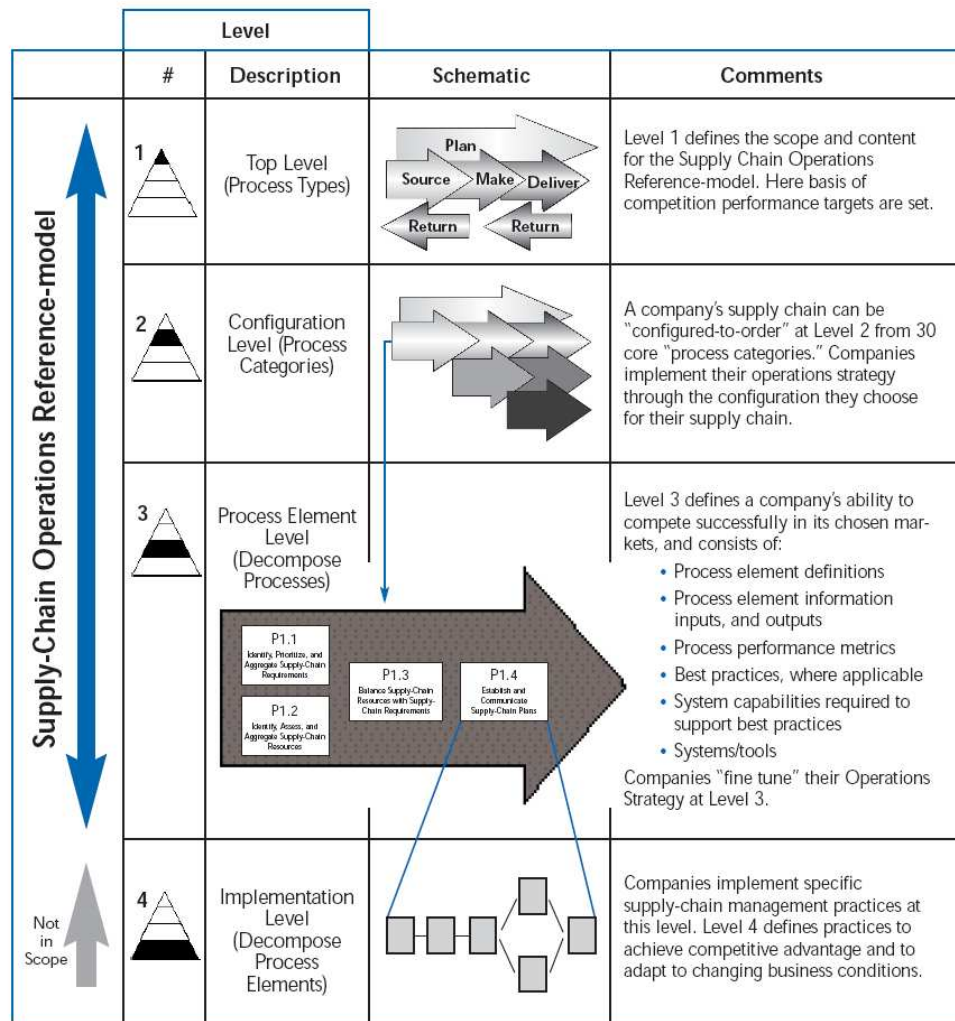


Figure 3: SCOR Levels of Process Detail

### APPENDIX 3: SCM DEFINITIONS

Source: Mentzer et al. (2001)

Monczka, Trent, and Handfield (1998)	SCM requires traditionally separate materials functions to report to an executive responsible for coordinating the entire materials process, and also requires joint relationships with suppliers across multiple tiers. SCM is a concept, "whose primary objective is to integrate and manage the sourcing, flow, and control of materials using a total systems perspective across multiple functions and multiple tiers of suppliers."
La Londe and Masters (1994)	Supply chain strategy includes: "... two or more firms in a supply chain entering into a long-term agreement; ... the development of trust and commitment to the relationship; ... the integration of logistics activities involving the sharing of demand and sales data; ... the potential for a shift in the locus of control of the logistics process."
Stevens (1989)	"The objective of managing the supply chain is to synchronize the requirements of the customer with the flow of materials from suppliers in order to effect a balance between what are often seen as conflicting goals of high customer service, low inventory management, and low unit cost."
Houlihan (1988)	Differences between supply chain management and classical materials and manufacturing control: "1) The supply chain is viewed as a single process. Responsibility for the various segments in the chain is not fragmented and relegated to functional areas such as manufacturing, purchasing, distribution, and sales. 2) Supply chain management calls for, and in the end depends on, strategic decision making. "Supply" is a shared objective of practically every function in the chain and is of particular strategic significance because of its impact on overall costs and market share. 3) Supply chain management calls for a different perspective on inventories which are used as a balancing mechanism of last, not first, resort. 4) A new approach to systems is required—integration rather than interfacing."
Jones and Riley (1985)	"Supply chain management deals with the total flow of materials from suppliers through end users..."
Cooper et al. (1997)	Supply chain management is "... an integrative philosophy to manage the total flow of a distribution channel from supplier to the ultimate user."

## APPENDIX 4: SUPPLY CHAIN SCHOOLS OF THOUGHT

Source: Bechtel and Jayaram (1997)

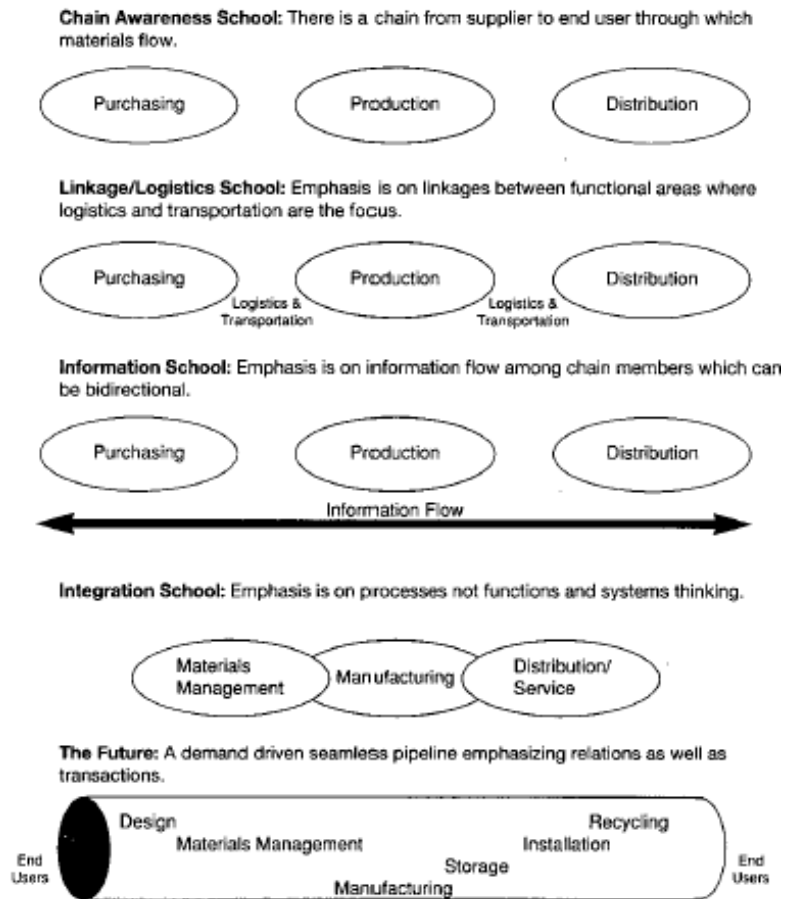


Figure 1: Graphical Representation of Schools of Thought

Supply Chain Schools of Thought	
Author(s)	Definition
	<b>Chain Awareness School</b>
Jones and Riley (1985)	"Supply chain management deals with the total flow of materials from suppliers through end users." (p. 19)
Houlihan (1988)	"Supply chain management covers the flow of goods from supplier through manufacturer and distributor to the end user." (p. 14)
Langley and Holcomb (1991)	"Supply chain management focuses attention on the interactions of channel members to produce an end product/service that will provide best comparative value for the end user." (p. 14)
Cavinato (1991)	"... the entire sourcing, value-added, and marketing activities of the overall link of firm up to final customers." (p. 32)
Novack and Simco (1991)	"Supply chain management covers the flow of goods from the supplier through the manufacturer and distributor to the end user." (p. 32)
Stevens (1990)	"Control the flow of material from suppliers, through the value adding (production) processes and distribution channels, to customers."
Lee and Billington (1992)	"Networks of manufacturing and distribution sites that procure raw materials, transform them into intermediate and finished products, and distribute the finished products to customers." (p. 65)
	<b>Linkage/Logistics School</b>
Scott and Westbrook (1992)	"...supply chain is used to refer to the chain linking each element of the production and supply process from raw materials through to the end customer." (p. 23)
Turner (1993)	"...technique that looks at all the links in the chain from raw materials suppliers through various levels of manufacturing to warehousing and distribution to the final customer." (p. 52)
	<b>Information School</b>
Johannson (1994)	"SCM is really an operations approach to procurement. It requires all participants of the supply chain to be properly informed. With SCM, the linkage and information flow between various members of the supply chain are critical to overall performance."
Towill, Naim and Wikner (1992)	"A supply chain is a system, the constituent parts of which include material suppliers, production facilities, distribution services, customers linked together via the feed forward of materials and the feedback flow of information." (p. 3)
Manrodt and Harrington (1995)	"Product and information flow encompassing all parties beginning with the supplier's suppliers and ending with customers or consumers/end users... flows are bidirectional."
	<b>Integration School</b>
Cooper and Ellram (1990)	"An integrative philosophy to manage the total flow of a distribution channel from the supplier to the ultimate user." (p.1)
Ellram and Cooper (1993)	"Supply chain management is an approach whereby the entire network from which suppliers through the ultimate customer, is analyzed and managed in order to achieve the 'best' outcome for the whole system." (p.1)
Hewitt (1992)	"Supply chain integration is only a natural result of redesigned business processes not realignment of existing functional organizations." (p.340)
	<b>Future</b>
Cavinato (1992)	"The supply chain concept consists of actively managed channels of procurement and distribution. It is the group of firms that add value along product flow from original raw materials to final customer. It concentrates on relational factors rather than transactional ones." (p. 285)
Farmer (1995)	"Instead of using the term supply chain management, we should use the idea of a seamless demand pipeline."

Table 1: Authors Associated with Schools of Thought

## APPENDIX 5: THEORIES OF THE FIRM – TOWARDS A UNIFIED THEORY OF LOGISTICS

Source: Mentzer et al. (2004)

Theory	Overarching assumption – the primary objective of the firm, the primary rationale for firms to exist, is to maximize profit	
	Basic premise	Assumptions
Neoclassical model	Goal is to maximize profits. Suggests firms exist to acquire and utilize resources to produce a good. The firm is viewed in terms of the production function – the converting of labor and capital into goods and services	Perfect competition in the market, the firm's ability to obtain perfect and complete information, freely available production resources that are infinitely divisible and mobile across uses (Anderson, 1982; Conner, 1991; Cyert and March, 1963; Simon, 1955), and does not consider the degrees of risk associated with different investment alternatives (Anderson, 1982)
Market value model	The objective of the firm – which exists in a perfectly competitive capital market – is to consider the risk differences among investment alternatives to maximize present market value or the price of the firm's stock (Anderson, 1982; Fama and Miller, 1972; Seth and Thomas, 1994)	Does not acknowledge owner monitoring costs of managers
Agency cost model	A modification of the market value model, whose objective is still to achieve economic value maximization. Suggests an agency relationship exists between stockholders and managers in which managers are given authority to make decisions to perform specified services (Jensen and Meckling, 1976)	Recognizes the different interests of owners and managers and that they may pursue self-interests (Anderson, 1982). Thus, the model proposes stockholders incur monitoring costs to minimize the possibility of poor management decisions

Table 1: Economic Theories of the Firm

Overarching assumption – the neoclassical objective of profit maximization is questionable, based on observations of managerial behavior (Anderson, 1982)		
Theory	Basic premise	Assumptions
Behavioral model	Firms exist to achieve satisfactory, rather than maximum, profits. Adopts a coalitional perspective where various subunits of the organization make decisions regarding different problems at different points in time (Cyert and March, 1963)	Stakeholders of the organization determine the objectives of the firm. Since different stakeholders have different goals, it is necessary to resolve conflict through bargaining
Resource dependence model	Goal is to maximize profits. Firms exist to acquire and utilize resources to produce. The firm is viewed in terms of the production function – the converting of labor and capital into goods and services (Penrose, 1959). The focus is on the skill and luck in acquiring and utilizing resources to achieve above-normal earnings, which is a reason for the organization of the firm, even in the absence of opportunism (Conner, 1991)	Organizations adapt their objectives based on the constraints imposed on the organization by the various stakeholders and environmental coalitions (stockholders, creditors, and suppliers) (Pfeffer and Salancik, 1978). The objective of the firm is to survive through maintaining support and obtaining resources through external coalitions (Anderson, 1982)
Resource-based theory	A firm should select the strategy that takes into account the relationship between its resources and environmental opportunities in the generation of rents (defined as “the return in excess of a resource owner’s alternative use costs”) (Mahoney, 1996, p. 91)	Rents result from accumulating and utilizing heterogeneous resources better than competitors, achieved through government protection, scarce resource ownership, and entrepreneurial insights in an uncertain environment (Mahoney, 1996). Rent is based on how the firm uses its core competencies (unique resources and relationships) (Penrose, 1959; Rumelt, 1984)
Comparative institutional theory	Firms obtain rents even if some assumptions of the resource-based view are not met (Hennart, 1994). Rents are based on returns on assets and management skill at coordinating interactions with other resource owners. Firms reduce costs by organizing both internal and external transactions cheaper than competitors	Cooperation through joint effort or exchange yields gains that can be shared by the cooperating parties. Firms and markets perform three tasks: (1) create awareness of the gains that can be achieved through cooperation, (2) prevent parties from bargaining to increase their own gains, and (3) enforce agreed-upon terms (Hennart, 1994)
Knowledge-based theory	Firms may exist due to knowledge-based transaction costs (Conner and Prahalad, 1996)	Knowledge-based transaction costs can exist even in the absence of opportunistic behavior. Non-opportunistic parties may not agree or arrive at a course of action due to differences in knowledge rather than due to serving self-interests
Resource-learning theory	Managers’ mental models (in addition to firm resources) are sources of firm heterogeneity (Mahoney, 1996)	Since rents can be derived from both behavioral and cognitive logic, they are interrelated and necessary for sustainable competitive advantage
Constituency-based theory	Incorporates the functional areas of the firm as the unit of analysis in attempting to understand the various goals that may arise within an organization (Anderson, 1982). Each functional area (such as logistics) is viewed as a specialist that provides unique resources to the firm	There is a tendency for each functional area to pursue its own objectives, thereby constraining the objectives of other departments. As a result, the objectives of the firm are negotiated among the various functional units, often with some units having more influence due to the ability to provide important resources

Table 2: Behavioural Theories of the Firm

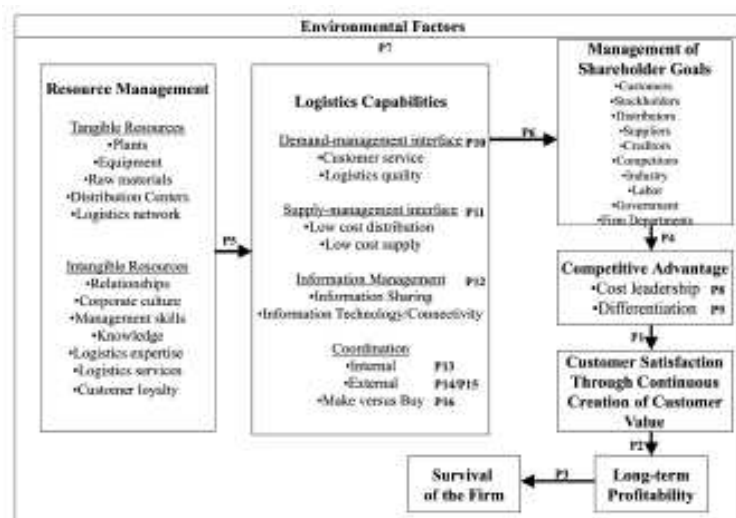
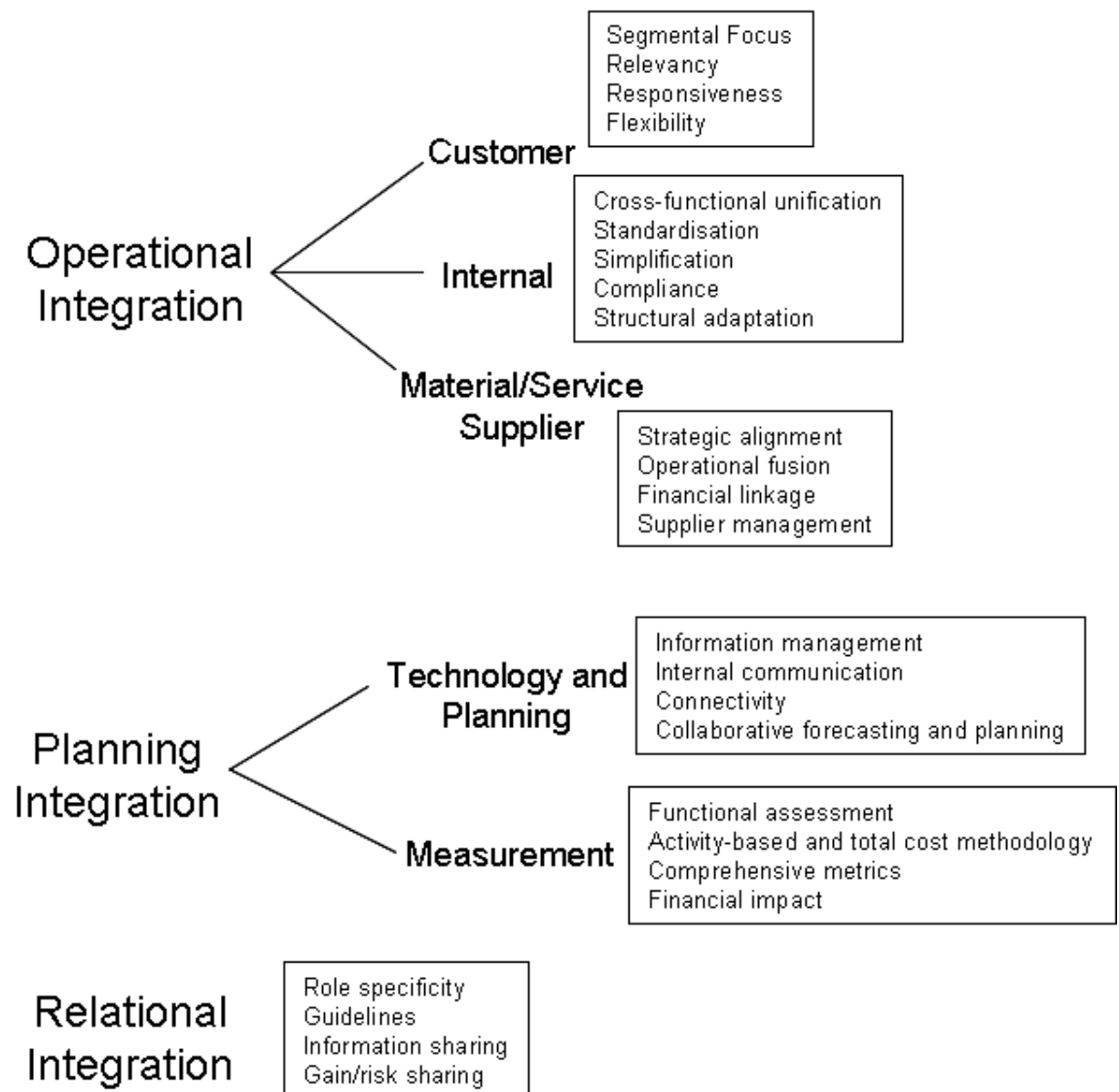


Figure 1: A Unified Theory of Logistics

## APPENDIX 6: SUPPLY CHAIN 2000 FRAMEWORK – SIX COMPETENCIES

Source: Bowersox et al. (1999)



## **APPENDIX 7: REVIEW OF PREVIOUS EMPIRICAL STUDIES**

### **Introduction**

Over the past decade or more, much empirical research has been undertaken in the SCM field. Indeed, and as noted earlier, much of the SCM literature could be classified as being primarily empirical-descriptive (Croom et al., 2000). What this means is that empirical research is carried out to assess the state of practice in relation to one or more SCM domains and that this research is disseminated by describing the practices uncovered. In other words, inductive work based on observed practice aimed at theory building is often limited. In addition, whilst some papers attempt some form of prescription of “best practice” based on observed practice most simply describe what has been observed.

As part of his literature review for this thesis the author has conducted a comprehensive analysis of much of the empirical research which has been published over the past decade or so. A review of this nature could never be exhaustive; rather, the author has attempted to select a representative sample of the work which has appeared in a range of international peer-reviewed journals in recent years. Nonetheless, 90 empirical studies have been reviewed. These studies represent a range of SCM domains over a period of more than a decade. The focus was deliberately on work published in more recent years. Given the rapid rate of development in this field in recent years more recently published work is likely to be of more interest and benefit from both a technical and methodological point of view. The geographical bases of the researchers and the geographical scope of the studies are broad. Finally, the studies reviewed have employed a range of research strategies and have been published in a relatively large number of different journals.

### **SCM Domains**

The papers reviewed covered a range of SCM domains (see Table 1 and Figure 1). Before describing the categories it is worth noting that many of the papers are difficult to classify into just one domain as they span a number of interrelated areas. In such cases the primary objectives and focus of the paper was used as the basis for the classification. Where a paper takes a broad strategic view of SCM and attempts to deal with genuinely cross-functional and cross-company issues, then it is classified in the “strategic” category (see below). The first three categories are based on the “buy-make-



move-store-sell” model of the supply chain introduced earlier. The first category (“buy”) includes research with a primary focus on procurement, purchasing and supplier management aspects of SCM. The second category (“move/store”) relates to papers which are mainly concerned with physical distribution (i.e. transportation and warehousing) issues. The third category (“make”) includes the relatively small number of papers which are concerned specifically with manufacturing (including production planning and control) questions.

<u><b>Domain</b></u>	<u><b>Number</b></u>
Buy	12
Move/Store	9
Make	3
Quality	4
Technology	9
Performance	7
Strategy	19
Learning	6
By Country	15
Other	6
<b>Total</b>	<b>90</b>

Table 1: SCM Domains in Empirical Studies

The next category (“quality”) contains papers which focus on the role of quality management (including total quality management, quality systems and statistical quality control) in the supply chain. A relatively large number of papers are included under the next two categories (i.e. “technology” and “performance”). This reflects the proliferation of interest in these two areas in recent years. The latter includes papers which are concerned mainly with ICT application in the supply chain; the latter includes papers which have performance measurement issues as the central theme. The largest single group of papers is in the “strategy” category. In this context, the author has listed papers which take a broad strategic view of SCM and attempt to deal with genuinely cross-functional and cross-company issues. Many of the papers in this category are concerned with relationship management issues. The “learning” domain includes papers which relate to people, education, training and supply chain learning issues. There are few papers in this domain but interestingly most were published quite recently, perhaps reflecting the development of an interest in what is an emerging SCM area.

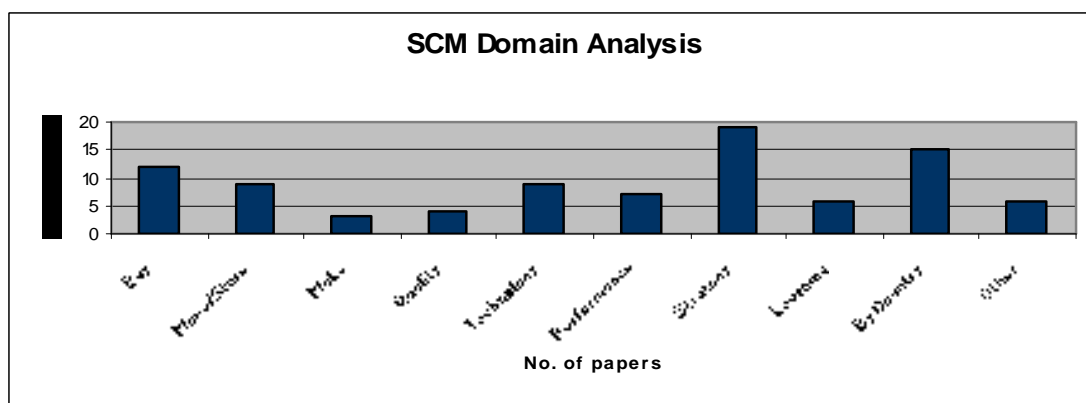


Figure 1: SCM Domains in Empirical Studies

The final substantive category is “by country”. This comprises research which was aimed chiefly at discovering the state of practice in particular geographical regions. Finally, there are a number of papers which do not fit easily into any of the above categories (“other”).

### Trends Over Time

The data in Table 2 and Figure 2 show the number of papers considered in this review in terms of date of publication. The data indicate a general upward trend during the period in question. This is in line with the major bibliographic review of Charvet et al. (2008) which concluded that the, “citation analysis indicates an explosion of interest across disciplines and journals” (p. 64). It should be noted however that their study was a broad-based review off all published papers in the SCM field; the current review is restricted to empirical-based work. Their work also suggested that:

The explosion of interest may show signs of abating; however, it is too early to tell. Clearly the exponential growth rate will inevitably plateau (p. 65).

The author’s review of the empirical studies shows no sign of this plateau effect with the number of papers published in 2008 easily the highest of the thirteenn years under consideration. However, as noted earlier the author deliberately focused on more recent year which might explain this observed difference.

<u>Year</u>	<u>Number</u>
1996	1
1997	2
1998	2
1999	4
2000	2
2001	5
2002	7
2003	10
2004	5
2005	11
2006	11
2007	12
2008	18
<b>Total</b>	<b>90</b>

Table 2: Empirical Papers Published (1996-2008)

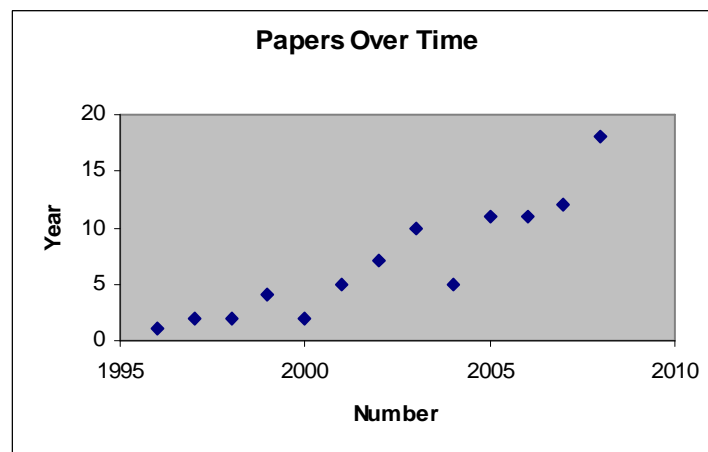


Figure 2: Empirical Papers Published (1996-2008)

## Sectors

The data in Table 3 and Figure 3 show the sectoral focus of the reviewed empirical studies. Many papers (listed under “various”) incorporated a wide range of sectors. A number of recent papers illustrate this breadth (for example: Ketikidis et al. (2008) focused on “manufacturing and trading”; Toyli et al. (2008) on “manufacturing, wholesale and retail”; Heide et al. (2008) on “trade and manufacturing”).

<b><u>Sector</u></b>	<b><u>Number</u></b>
Various	36
Various manufacturing	30
Specified sectors	13
Retail	2
3PL	3
Other	2
Not specified	4
<b>Total</b>	<b>90</b>

Table 3: Empirical Studies by Sector

A large number of papers have a focus on manufacturing organisations in general (“various manufacturing”) which is perhaps not surprising given that much SCM theory and practice has its origins in manufacturing. Some papers had a much narrower focus (“specified sectors”) exploring particular industry sectors in some detail (for example: Brun et al. (2008) examined the luxury fashion industry; Davila and Wouters (2007) studied disk drive manufacturing; Korneliussen and Gronhaug (2003) focussed on the salmon farming industry). A small number of studies were specifically concerned with the retail and 3PL links in the supply chain. Two studies defied classification and are listed under “other”: one (Halldorsson et al., 2008) was a postal questionnaire administered to individual members of CSCMP while another (Al-Mudimigha et al., 2004) is based on two case studies (a retail outlet and a public hospital). Four studies did not specify the sector being researched.

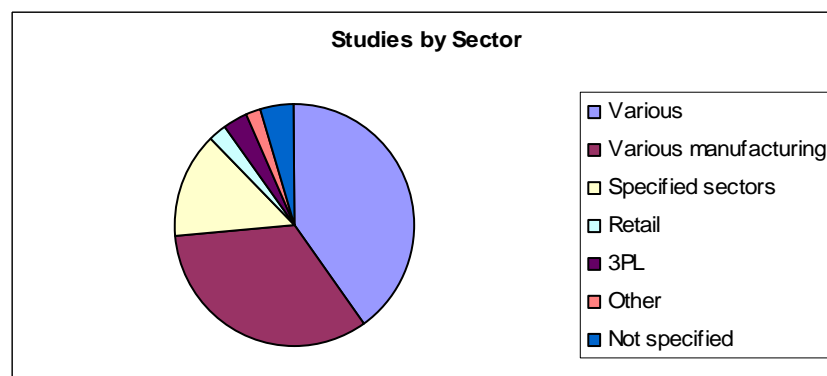


Figure 3: Empirical Studies by Sector

There is some evidence that the practical experience upon which much SCM theory relies is often confined to a relatively small number of key industry sectors (see, for

example, Burgess et al., 2006). However, this review indicates that empirical research has been conducted across a broad base of sectors with a relatively small number of papers from those sectors traditionally regarded as important.

### Author Base and Geographical Scope

The data in Table 4 and Figure 4 shows the location in which the author(s) are based, as stated in organisational affiliations listed in the papers.

<b><u>Author Base</u></b>	<b><u>Number</u></b>
USA	22
UK	13
Scandinavia	10
Other European	13
Australasia	12
Transnational/Other	20
<b>Total</b>	<b>90</b>

Table 4: Empirical Research Author Base

Not surprisingly, the majority of authors are based in the USA or Europe. The relatively high number of papers by Scandinavian<sup>40</sup> scholars reflects the strength of SCM research in that region.

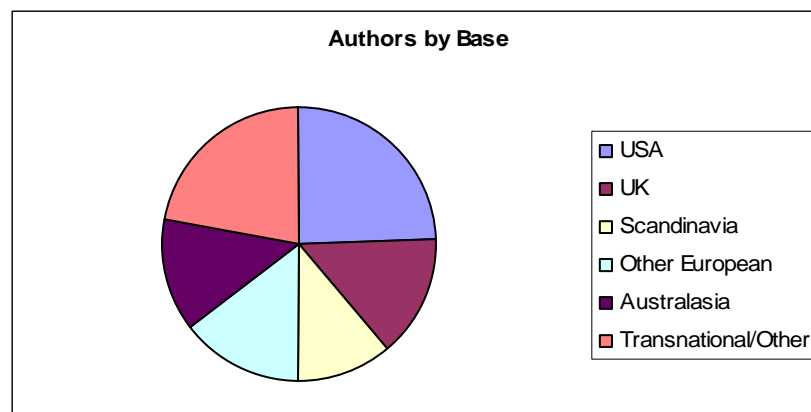


Figure 4: Empirical Research Author Base

The “transnational/other” category includes papers which are based on various types of research collaborations. Firstly, several papers involve collaboration between authors from developed countries (particularly the USA) and developed countries (e.g. Bhutta et al. 2007; McCormack et al., 2008). Secondly, a number of papers are based on EU

<sup>40</sup> In this context Scandinavia includes Norway, Sweden, Denmark and Finland.

supported collaborative research involving academics from various EU countries (e.g. Carbone and de Martino, 2003; Evangelista and Sweeney, 2008). Thirdly, some collaborative papers specifically aim to reflect the increasingly global nature of SCM (e.g. Sila et al., 2006; Bagchi et al., 2005).

In terms of the geographical scope of the studies a similar picture emerges (see Table 5 and Figure 5). The majority of papers are concerned with practice in organisations based in the USA or Europe, with a relatively large number based on Scandinavian practice.

<b><u>Geographical Scope</u></b>	<b><u>Number</u></b>
North America (including	
USA)	18
UK	10
Scandinavia	9
Other European	15
Australasia	18
Transnational/Other	20
<b>Total</b>	<b>90</b>

Table 5: Geographical Scope of Empirical Studies

However, it is also worth noting that researchers based in the USA, the UK and Scandinavia tend to look beyond their geographical areas in terms of SCM research. There are just 18 papers exploring practice in North America compared with 22 papers by USA-based authors. Similarly, there are 10 papers which look at practice in the UK but 13 by UK-based authors (the figures are 9 and 10 respectively for Scandinavia). For example: the work of the USA-based Spekman et al. (1998) studies supplier partnering issues in five industry groups in the Americas and Europe; the fieldwork described in the paper of UK-based Mangan and Christopher (2005) was carried out in the UK, the USA, the Netherlands and Ireland; the scope of Norway-based Korneliussen and Gronhaug (2003) was Norway and Singapore.

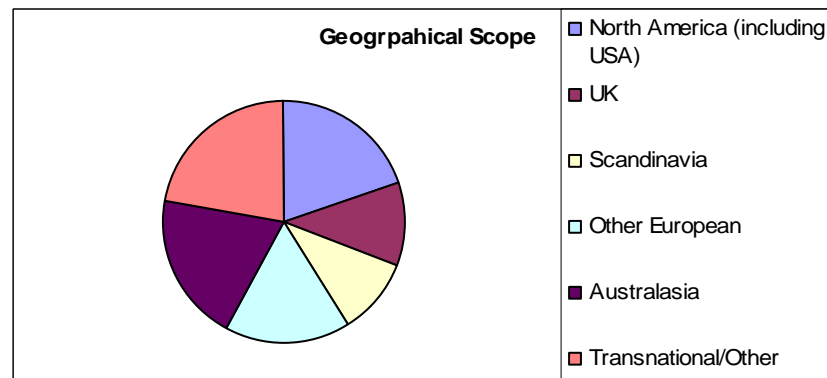


Figure 5 – Geographical Scope of Empirical Studies

Of the research in the “transnational/other” category, a number claim to be “global” in scope (Choi and Hong, 2002; Frohlich and Westbrook, 2001; Davila and Wouters, 2007). The others often involve cross-country comparisons (for example, Szejcowski et al. (2001) in relation to supplier management in Germany and the UK and Halldorsson et al. (2008) in relation to perceptions of SCM among managers in the USA and Scandinavia) or studies of covering more than one country in the same region (for example, Australia and new Zealand in the case of Mollenkopf and Dapiran, 2005 and the south-eastern European countries of Albania, Bulgaria, Macedonia, Greece, Romania, Serbia and Montenegro in the case of Ketikidis et al., 2008).

### **Research Strategy**

The data reported above indicates that a wide variety and SCM domains across a range of sectors have been empirically studied over the last decade or so. Furthermore, the studies have been based in variety of countries/regions internationally and carried out by researchers based in various locations. The research strategies adopted by researchers are also of interest, particularly in terms of the methodologies used for data collection, samples sizes and response rates (where surveys were used) and the number of companies studied (where case study approaches were adopted).

### ***Data Collection Method***

The data in Table 6 and Figure 6 are concerned with the research strategy adopted with respect to the main approaches adopted in data collection.

<b><u>Research Strategy</u></b>	<b><u>Number</u></b>
Mail or web survey	54
Case study	18
Interviews	7
Mixed	5
Other (including focus group)	6
<b>Total</b>	<b>90</b>

Table 6: Empirical Research Approach Adopted

The data indicate that quantitative surveys, administered by post or by web/email, are by far the most widely used instrument for data collection. 54 studies used surveys as the primary data collection mechanism. Single or multiple case studies were used by 18 authors, with seven using telephone or face-to-face interviews. Perhaps surprisingly, just five papers reported the use of mixed methods.

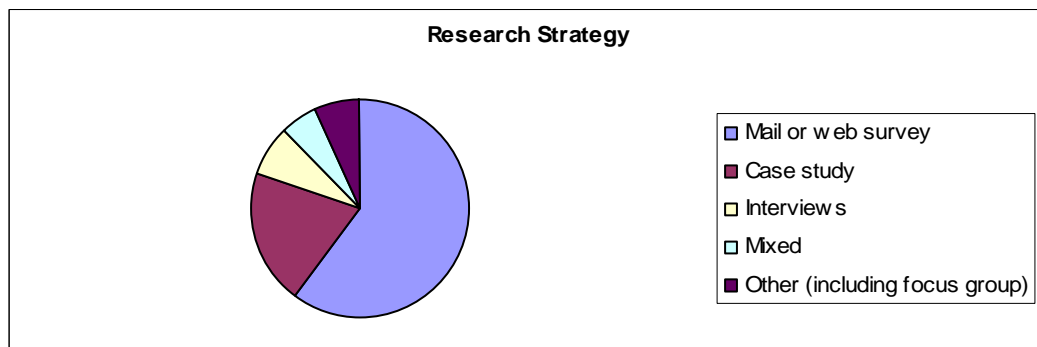


Figure 6: Empirical Research Approach Adopted

### ***Survey Sample Sizes and Response Rates***

The great majority of the 54 studies reviewed which made use of surveys reported on the size of the sample used and the response rate achieved<sup>41</sup>.

The sample sizes varied from the lowest which was 81 (Halldorsson et al., 2008)<sup>42</sup> to the highest which was 6000 (Hsu et al., 2008). The mean was 1131. The data in Figure

<sup>41</sup> Both Frohlich and Westbrook (2001) and Narasimham and Kim (2002) reported number of responses but not the sample size used.

<sup>42</sup> However, it should be noted that the sample size of 81 referred to the Scandinavian part of the survey; there was a sample size of 559 for the USA part of this comparative study.



7 shows the percentage breakdown of sample sizes. Perhaps most interestingly, the great majority of papers provided no justification in terms of the size of sample adopted.

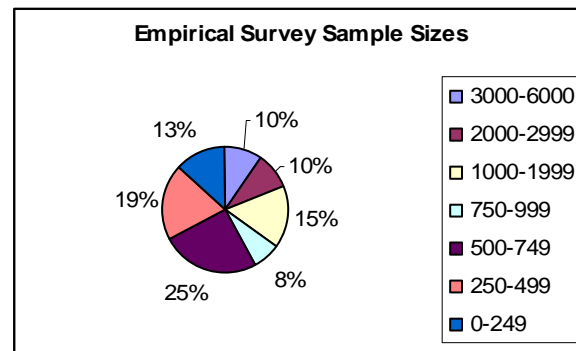


Figure 7: Survey Sample Sizes

A relatively small number – four – of the studies reviewed specifically reported that an email or web-based survey had been carried out. Given the relative ease with which large numbers of potential respondents can be contacted using such mechanisms it is perhaps surprising that the sample sizes in these four surveys were in ascending order: 2500 (McCormack et al., 2008), 2225 (Toyli et al., 2008), 1949 (Wu et al., 2006) and 300 (Ketikidis et al., 2008). This means, for example, that just two of the ten surveys with the highest sample sizes specifically reported the use of email or web-based approaches. This may be partly explained by authors not yet widely reporting that specific use was made of these approaches.

In terms of response rate, they varied from the lowest which was 5.7% (Bagchi et al., 2005) to the highest which was 70.9% (Spekman et al., 1998). In the case of the latter study it is important to note that the sample was generated from a list of client firms associated with the study's sponsor, which probably accounts for the high response rate. In other studies with unusually high response rates underlying factors of varying kinds can in most cases be identified. The data in Figure 8 shows the breakdown of response rates - the mean was 24.7%.

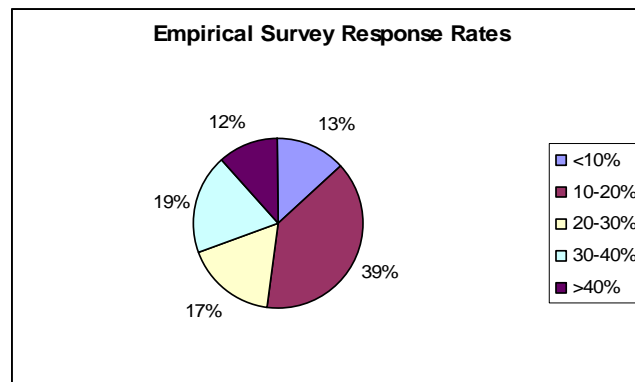


Figure 8: Empirical Survey Response Rates

It is interesting to note that the majority of response rates are less than 20% with rates between 10 and 20% (39% of the total) being most common. Finally, those studies which specifically reported the use of email or web-based surveys (see above) had response rates between 9.4% and 26.3%. This is relatively high given some of the challenges associated with administering surveys of this kind (see, for example, Grant et al. (2005)).

### ***Case Study Methods***

As noted earlier a minority of the empirical studies reviewed (18 in total) made use of the case study methodology. A number of other studies which reported the use of interviews, focus groups and mixed approaches also made use of case study approaches to greater or lesser extents. Where case study approaches were used there was evidence of variation in terms of the number of case companies studied. For example, seven of the studies were based on a single company. In these cases a range of sectors (including retail, automotive and electronics) were studied. Where multiple cases were studied, in some cases a number of companies in the same sector were examined (for example, Brun et al. (2008) studied 12 companies in the luxury fashion sector) while others involved multiple organisations across different sectors (for example, Gilmour (1999) studied six packaged goods and three automotive companies). Several studies focussed on inter-company supply chains (for example, Lambert and Cooper (2000) and Storey et al. (2006)).

## Journals

The empirical studies reviewed by the author appeared in a range of academic journals (see Table 7 and Figure 9). The fact that almost 30 different journals are represented is indicative of the broad interest in SCM across a range of disciplines. This is in line with the findings of Charvet et al. (2008). The majority of these journals specialise in logistics and SCM issues (i.e. IJPDLM, SCMIJ, IJLM, IJLRA and JBL). The others are broader in scope (e.g. IJOPM) and/or specialise in fields related to logistics and SCM (e.g. IMM).

<b><u>Journal</u></b>	<b><u>Number</u></b>
<i>International Journal of Physical Distribution and Logistics Management</i> (IJPDLM)	21
<i>Supply Chain Management: An International Journal</i> (SCMIJ)	14
<i>International Journal of Logistics Management</i> (IJLM)	9
<i>International Journal of Operations and Production Management</i> (IJOPM)	9
<i>International Journal of Logistics: Research and Applications</i> (IJLRA)	4
<i>Industrial Marketing Management</i> (IMM)	4
<i>International Journal of Production Economics</i> (IJPE)	4
<i>International Journal of Management Science</i> (IJMS)	3
<i>Journal of Business Logistics</i> (JBL)	2
<i>European Journal of Operations Research</i> (EJOR)	2
Others	18
<b>Total</b>	<b>90</b>

Table 7: Empirical Studies by Journal

Gibson et al. (2004) produced a “composite usefulness index” for a range of journals based on a survey of US and European academics. It is interesting to note that:

- five out of the top six rated journals in Europe appear in Table 7 (the exception being the *Harvard Business Review*); and
- three of the top five rated journals in the USA appear in Table 7 (the exceptions being *Supply Chain Management Review* and the *Harvard Business Review*).

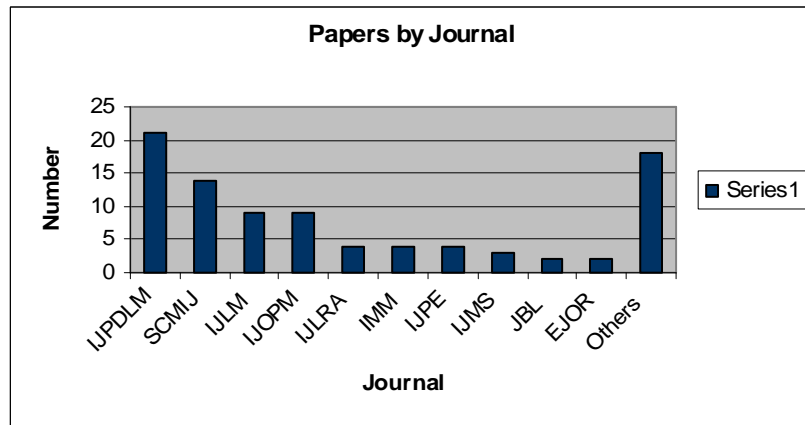


Figure 9: Empirical Studies by Journal

## APPENDIX 8: SUMMARY OF PAPER USING FOCUS GROUP METHOD IN LOGISTICS/SCM

Source: Sanchez Rodrigues et al. (2010)

Author	Research strategy	Role of focus group	Design	Conduct	Analysis
<i>Descriptive</i>					
Holweg and Mieniczuk (2002)	Focus group → Process map → Survey → Modelling	To obtain background data on the supply chain and propose future state scenarios	Involved research sponsors but no other information provided	No information provided	No information provided
<i>Exploratory – sole method</i>					
Mangan and Christopher (2005)	Literature review → Focus group and survey	Obtain the views of students of an executive education course on management skills	One focus group of 10 students from a Masters course run by authors	No information provided	No information provided
Cullen and Webster (2007)	Literature review → Focus group	To determine the mechanisms used for the sale and purchase of products, and the role of e-commerce in these	Four focus groups planned but only three carried out. Made up of 4–6 postgraduate students and individuals known to the researchers, selected by purposive sampling	Round table, structured discussion	Identified clusters of topics and also coding of results. Theory saturation tested
Manuj and Mentzer (2008)	Focus group and interviews	To identify elements of risk in global supply chains and how they are mitigated	One focus group with seven executives from a global manufacturing firm	No information provided	No, although theory saturation testing with the interviews
<i>Exploratory – construct development</i>					
Sink et al. (1996) and Sink and Langley (1997)	Literature review → Focus group → Survey	Refined a comprehensive literature review undertaken on 3PL theory. Also influenced the design process of a wider-scale questionnaire-based survey	One focus group of 11 members representing a broad base of industry. Some selection criteria	Semi-structured discussion	Identified clusters of issues
Mentzer et al. (1997, 1999)	Literature review → Focus group → Survey	Helped the researchers to understand the logistics service quality needs of the Defence Logistics Agency's customers. The focus groups findings supported the research team in refining a questionnaire	13 focus groups with a broad base of opinions. All participants customers of the DLA	Unstructured	Identified clusters of topics and also coding of results. Also researcher triangulation
Dimwoodie (2001)	Focus group → Survey	Explored the motivations for students to study a Masters degree programme	The number of focus groups is not stated but they involved enrolled students	No information provided	No information provided
Laucioni et al. (2001)	Focus group → Survey	Developed a list of barriers to developing logistics programmes	Four focus groups of 5 to 6 administrators, faculty and deans from Business Schools	No information provided	List of barriers produced and duplicates removed
Golicic et al. (2003)	Literature review → Focus Group → Survey	Applied to explore and understand inter-organisational relationships	Two focus groups, with 5 and 9 participants. Covered 7 industrial sectors	Unstructured	Coding of results and researcher triangulation
Guinipero et al. (2005)	Focus group → Survey	To gain information on trends, skill, knowledge and training for supply chain managers	Four focus groups across the US. Participants invited from Fortune 1000 companies. 58 executives from 41 companies attended	Unstructured	Identified clusters of issues
Evangelista and Sweeney (2006)	Focus group → Survey	To verify completeness of the survey instrument and obtain further engagement in research	Two focus groups in Milan and Rome with a total of 20 participants from industry and academia	Structured, based around draft survey instrument	No information provided
Tian et al. (2008)	Literature review → Focus group → Survey	To confirm that the survey instrument was complete and understandable	One focus group involving 3 managers from 2 manufacturing firms	Structured, based around draft survey instrument	No information provided
<i>Exploratory – other</i>					
Christopher and Jutner (2000)	Focus group → Case studies	To gain insights into current practice on managing supply chain relationships	12 focus groups arranged at a conference. Open invitation to conference delegates	No information provided	No information provided
Rae-Smith and Ellinger (2002)	Action research → Focus group	Applied to evaluate the extent an online logistics system (implemented through action research) was helping to improve customer service	One focus group for employees of the company involved in the action research	Structured	No information provided.
<i>Explanatory – survey results</i>					
New and Payne (1995)	Survey → Focus Group	Applied to validate results of a survey (2.5% response rate) regarding supply chain integration in logistics	Seven focus groups across the UK. 51 participants from a range of industries with group sizes from 3 to 13. Invitations sent to personal contacts of research team	Organised as a dinner party with food and then an unstructured discussion	Identified clusters of issues

Author	Research strategy	Role of focus group	Design	Conduct	Analysis
Rinehart et al. (2004)	Literature review → Survey → Focus group	Conducted in order to determine appropriate descriptive terms for each cluster identified in the survey.	Three focus groups of executive MBA students and company executives, all involved in relationship management. 75 participants in total.	Structured, with a range of descriptive terms provided for delegates to select from	Ranking of the descriptive terms for each cluster based on frequency of selection
Jutner (2005)	Survey → Focus Group	To provide more depth and insights to survey findings especially as the survey had an 8% response rate	Six focus groups arranged at a conference. Open invitation to conference delegates. Each focus group had 7 to 8 participants	Structured	Identified clusters of issues
Bernon and Cullen (2007)	Case studies → Survey → Focus Group	To compare case study and survey findings with participants' experiences in reverse logistics.	One focus group with six sectors represented.	No information provided	No information provided.
<i>Explanatory – other opinion based methods</i>					
Dainty et al. (2001)	Interviews → Focus Group	To refine a set of change requirements for improving supply chain integration, obtained through interviews	Three focus groups across the UK. Composed of smaller construction sector companies and interviewees	Semi-structured and facilitated by the research team	Data analysed using NVIVO software
Blackhurst et al. (2005)	Case studies → Interviews → Focus group	To identify examples of supply chain disruptions to verify earlier findings	Three focus groups of between 10 and 14 participants from a number of industry sectors.	Structured.	Identified clusters of issues.
Jutner et al. (2007)	Literature review → Workshop → Focus group	Verification and improvement of framework developed in workshop	One focus group of 14 participants representing a range of industries	No information provided	No information provided
Melnik et al. (2009)	Literature review → Delphi study → Focus group	Discuss and refine the findings from the Delphi study	One focus group of 25 participants drawn from the Delphi study respondents	Semi-structured with a clustering exercise	Identified clusters of issues

## APPENDIX 9: FOCUS GROUP PARTICIPANTS AND COMPANY PROFILES

### Focus Group 1

**Location: Dublin**

**Date: April 2010**

**Number of Participants: 12**

<u>Job Role</u>	<u>Company</u>	<u>Nationality</u>	<u>Gender</u>
Planner	MAN1	Irish	F
Senior Planner	MAN2	Irish	M
Head of Logistics and Supply Chain	MAN3	Irish	M
Customer Relationship Manager	MAN4	British	M
Planner	MAN5	Irish	M
Finance and Accounting Supervisor	3PL1	German	M
Project Implementation Manager	3PL2	Irish	M
Import Co-ordinator	3PL3	Polish	F
Planner	3PL4	Irish	M
Operations Manager	3PL5	Irish	M
Product Services & Localization Manager	SW1	French	M
Logistics Officer	PS1	Irish	M

**MAN1** is a US-headquartered manufacturer of electrical cabling for communications networks. (approximately 200 employees in Ireland)

**MAN2**, part of a larger group of companies, is a US-owned manufacturer of generic pharmaceutical products. (approximately 360 employees in Ireland)

**MAN3** plc is a leading premium drinks business with a wide range of international brands across spirits, wine and beer. (approximately 360 employees in Ireland)

**MAN4** plc is a leading manufacturer, marketer and distributor of branded beverages in Ireland and the UK. (approximately 500 employees in Ireland)

**MAN5** manufactures concentrates and beverage bases for bottling companies throughout the world. (approximately 200 employees in this part of the Irish operation)

**3PL1** is a large US-headquartered global package delivery company. (approximately 1,000 employees in Ireland)

**3PL2** is part of the Irish operation of large international logistics group. (approximately 1,000 employees in Ireland)

**3PL3** is a privately owned short-sea carrier whose Irish division provides services to Eastern Europe. (approximately 10 employees in Ireland)

**3PL4** is part of an Irish-owned group of companies and is involved in the distribution of bulk fuels and related products throughout Europe. (approximately 260 employees)

**3PL5** is a Dublin-based family owned and managed company that manufactures and distributes a range of food products. (approximately 50 employees in Ireland)

**SW1** is the Irish operation of a large global software company. (approximately 1,700 full-time and 700 full-time contract employees in Ireland)

**PS1** encompasses the army, navy, air corps and reserve forces of Ireland. (approximately 10,500 employees)



## **Focus Group 2**

**Location: Dublin**

**Date: October 2010**

**Number of Participants: 10**

<b><u>Job Role</u></b>	<b><u>Company</u></b>	<b><u>Nationality</u></b>	<b><u>Gender</u></b>
Supply Chain Coordinator	MAN1	Irish	M
Quality Manager	MAN6	Irish	F
Logistics Operations Manager	MAN7	Estonian	M
Operations Manager	3PL6	Polish	F
Operations Supervisor	3PL7	Latvian	M
Transport Manager	3PL8	Irish	M
Marketing and Bus Dev Manager	3PL9	British	F
IS Consultant	SW2	Danish	M
Assistant Head of Department	PS2	Irish	M
Senior Buyer	PS3	Irish	F

**MAN6** is the Irish subsidiary of a large international life sciences group headquartered in the US. (It was winding down its Irish operations when the focus groups were conducted; 460 employees in MAN6 at peak in 2007)

**MAN7** is part of a large Irish multinational food company. (approximately 500 employees)

**3PL6** is an Irish firm that provides a range of logistics services including air and sea freight forwarding, national distribution, customs clearance and warehousing. (approximately 10 employees)

**3PL7** is a frozen food distributor and is part of a broad-based international group (approximately 200 employees in Ireland)

**3PL8**'s primary business is wholesale food distribution to franchise operators under the banner of a number of well know retail brands in Ireland. (approximately 1,500 employees)

**3PL9** is an Asian food retailer, wholesaler and distributor. (approximately 100 employees)

**SW2** is the Irish subsidiary of a leading player in the global IT industry. (approximately 100 employees in Ireland)

**PS2** is the Dublin Institute of Technology (DIT), one of Ireland's largest Higher Education Institutions. (approximately 3,000 employees)

**PS3** plc is a state-owned commercial company involved in the electricity business. (approximately 270 employees)

### **Focus Group 3**

**Location: Cork**

**Date: November 2010**

**Number of Participants: 6**

<b><u>Job Role</u></b>	<b><u>Company</u></b>	<b><u>Nationality</u></b>	<b><u>Gender</u></b>
Supply Chain Manager	MAN6	Irish	M
Senior Materials Manager	MAN8	Irish	M
Logistics Supervisor	MAN9	Irish	F
Account Management Supervisor	MAN10	Icelandic	F
IT Systems Analyst	3PL10	Irish	M
Naval Lieutenant Commander	PS1	Irish	M

**MAN8** was the Irish operation of a highly diversified global manufacturing company in the security and safety sector. (Its manufacturing operations in Ireland were discontinued and relocated to lower cost locations just prior to the focus group sessions; 475 employees in Ireland at peak in 2005)

**MAN9** is a subsidiary of a US-headquartered international bioscience and biopharmaceutical manufacturing firm. (approximately 500 employees in Ireland)

**MAN10** is the Irish-based shared services centre of a manufacturer of high performance cables (approximately 50 employees in Ireland)

**3PL10** is a major global supply chain management firm that offers a variety of value-added services to customers across a range of sectors (10,000 employees worldwide, the majority in Ireland)

## **APPENDIX 10: IDENTIFICATION OF QUESTIONNAIRE DATA REQUIREMENTS**

### **1. Background and Rationale**

Before investigating the each element of the *Four Fundamentals* construct in detail there are a few background issues that are worth exploring. These are captured in the first group of questions.

As noted in Chapter 2, a plethora of SCM definitions have been developed since the term was first introduced in the early 1980s. However, and as discussed earlier (in particular in section 2.7), there still appears to be some confusion as to what a supply chain is and what SCM is. For example: Mentzer et al. (2001) suggested that “there remains considerable confusion as to its meaning”; Lambert (2004) also used the word ‘confusion’ in this context by asserting that “there is a great deal of confusion regarding exactly what SCM involves”; Kathawala and Abdou (2003) concluded that “there is a high degree of variability in people’s minds about what is meant (by SCM)”. The first question to be asked, therefore, is:

#### **Q1A: What is meant by a supply chain and by supply chain management?**

As pointed out in section 2.13.2, there are a number of different schools of thought concerning the relationship between SCM and logistics. For example, Lummus et al. (2001) noted that it is not always clear how logistics differs from SCM. Similarly, Larson and Halldorsson (2004) pointed out that, “there is lack of agreement on how SCM is related to logistics”. This leads to the following two questions:

#### **Q1B: What is meant by logistics?**

#### **Q1C: What is the relationship between SCM and logistics?**

The literature review in Chapter 2 also revealed that several scholars, including New (1995) and Saunders (1995), contend that there is a confusing profusion of overlapping terminologies and meanings. Tan (2001) noted that, “the literature is replete with buzzwords”; Croom et al. (2000) also note that many labels can be found referring to supply chain and to practices for SCM; Cousins et al. (2006) also noted the use of a wide variety of terms and metaphors. This raises the following question:

**Q1D: Does the language and terminology used to define SCM contribute to confusion in understanding?**

Many of the SCM definitions in the literature attempt to provide short (often single-sentence) definitions (see section 2.4). As pointed out in section 2.7, in the author's view, the results are, almost inevitably, achievements in verbal and linguistic dexterity rather than definitions which are likely to add clarity from an SCM application perspective. Thus, the following question is raised:

**Q1E: Are single-sentence definitions of SCM of limited value?**

In the introduction to Chapter 2, the author suggested that there is evidence of differences in emphasis and approach between different functional backgrounds, business sectors and geographical areas.

Regarding functional orientation, Tan (2001) noted that the SCM has evolved from both a purchasing and supply perspective, as well as a transport and logistics perspective, with both following quite separate paths. Indeed, the literature review in Chapter 2 is based on work which has its origins in a diverse range of traditional disciplines, many of which are functionally-oriented. As noted in section 2.1, these disciplines (and associated functions) go beyond just purchasing (and supply) and transport (and logistics). For example, Lejeune and Yakova (2005) suggested that SCM comprises different inbound and outbound entities operating at various stages (i.e. procurement, production, distribution) in the supply chain. Given the importance of internal chain integration in the overall SCM paradigm (as captured in *Fundamental Two* – see section 2.9), any differences of emphasis between traditional functions may be significant.

With regard to business sectors, Burgess et al. (2006) suggest that most examples used to illustrate SCM concepts are from a limited number of sectors (such as retailing, IT and automotive) – see section 2.15.2. The author's experience suggests that there are differences in orientation and emphasis between these and other sectors when it comes to defining SCM. This is to be expected given the different strategic challenges and associated imperatives in different sectors. Furthermore, every sector tends to develop its own language over time, often in a way which reflects these challenges and imperatives.

In relation to geography, again there is some evidence of differences of emphasis between countries. For example, Grant (2004) argued that North American researchers and managers in logistics and SCM tend to focus more on transactional than relational issues in customer/supplier interaction, in contrast to their UK/European counterparts. These differences may be accentuated by language and cultural factors. As discussed in section 2.2.2 supply chains have become more international (and even global) in scope. In this context, any differences in emphasis between countries may have a significant impact on the design and management of international (or global) supply chain architectures.

The discussion in the preceding paragraphs leads to the following question:

**Q1F: Are there differences of emphasis based on (i) functional/professional background, (ii) business sector, and (iii) geographical base?**

## **2. *Fundamental One***

This section describes and justifies the detailed questions developed in relation to *Fundamental One* (SCM objectives).

### Background

This *Fundamental* is concerned with the main objectives of SCM – customer service and cost/investment. Before exploring each of these two elements in detail there are a couple of issues which are important.

It was argued in section 2.8.1 that the setting of objectives is of crucial importance for any planning activity and is central to the successful creation and implementation of any plan for several reasons. The management by objectives (MBO) has been written about for many years (e.g. Albrecht 1979; Humble 1971) and continues to attract attention (Aggarwala 2002). However, there has been little empirical investigation into MBO in a specific SCM context, thus raising the following question:

**Q2A: To what extent are specific SCM objectives formulated?**

*Fundamental One* suggests that the key SCM objectives are (see section 2.8.1):

- To meet or exceed the required or demanded customer service levels in targeted markets/segments; and,

- To optimise total supply chain investment and cost.

This service/cost approach has long been regarded as central to SCM (Christopher 1992) – this lead initially to the next question:

**Q2B: Do the two key SCM objectives relate to the market (i.e. customer service) and the financial (i.e. total supply chain cost and investment) dimensions of the supply chain?**

The focus group work described in Chapter 5 resulted in a third SCM objective being identified, i.e. environmental sustainability. In light of this, the question needs to be modified to:

**Q2B: Do the three key SCM objectives relate to the market (i.e. customer service), the financial (i.e. total supply chain cost and investment), and the environmental (i.e. sustainability) dimensions of the supply chain?**

#### Customer Service

These questions relate specifically to the setting of customer service objectives.

Several authors have suggested that customer service is becoming a key source of differentiation or an order winning criterion in many sectors (Christopher 2005). Indeed, Faulkner (2007), based on experience of assessing customer requirements in a variety of business sectors, argues that the importance of customer service relative to product quality (now largely an order qualifier) and price (largely determined by the dynamics of supply and demand in the market and subject to downward pressure in many sectors) has increased. This raises questions about the role of customer service in practice?

**Q3A: How important is customer service relative to price and quality?**

The use of external and internal audits has been suggested by some authors (e.g. Sterling and Lambert, 1989). The purpose of an external audit is primarily to understand customer expectations and competition service levels. An internal audit is used to assess the level of customer service provided and establish a benchmark against which changes in service can be appraised. Faulkner (2007) described a detailed approach which he has used as a consultant in several sectors. However, there is little empirical evidence about the extent to which such audits are used in practice, thus raising the following question:

**Q3B: To what extent are customer service audits used?**

There is some evidence that customer service is often quite narrowly interpreted by firms. For example, Sterling and Lambert (1989) assessed earlier research and concluded that many of the past studies in this area narrowly defined customer service and failed to measure it from a customer's point of view. Faulkner (2007) and NITL (2001) made a similar point and went on to suggest that the phrase "customer service" means something quite specific and well defined in an SCM context. This leads to the next question:

**Q3C: Is customer service interpreted narrowly?**

Table 2.4 shows the suggested constituent elements of customer service, based on the work of NITL (2001) and Faulkner (2007). As noted in section 2.8.2, most of these overlap with the elements suggested by Grant (2004) based on the original work of LaLonde and Zinszer (1976). The latter categorized the elements of customer service into (i) pre-transactional, (ii) transactional, and (iii) post-transactional elements. However, there has been little empirical investigation aimed at identifying the specific elements of customer service and their relative importance. This leads to the next two questions:

**Q3D: What are the elements of customer service?**

**Q3E: What is the relative importance of these elements?**

Section 2.8.2 argued that SCM is not just about *improving service* as the title of Christopher (1992) suggests. Rather the objective needs to be: *to meet or exceed the required or demanded customer service level in targeted markets/segments*. This raises the question:

**Q3F: Is there a difference between "improving customer service" and "meeting and/or exceeding the level of customer service required"?**

Section 2.8.2 also argued that the key is to recognise that understanding customer service requirements is the starting point in the supply chain design process (see Figure 2.8). The title of the paper by Korpela et al. (2001) 'Customer Service Based Design of the Supply Chain' captures this approach very effectively. In a similar vein, Faulkner (2007) argued that a market-driven customer service strategy – based on clearly understood customer requirements – sets the specification for integrated SCM. This leads to a question about the extent to which customer service levels 'set the spec' for SCM/supply chain design in practice:



**Q3G: Does understanding the level of service required set the specification for SCM/supply chain design?**

Total Supply Chain Cost and Investment

These questions relate to financial objectives, i.e. those that relate specifically to the optimisation of total supply chain cost and investment.

In section 2.8.3 the author argued that the emphasis must be on *total* supply chain costs. The key issue is that a reduction in expenditure in one part of the supply chain (e.g. purchasing) may result in an increase elsewhere (e.g. inventory holding costs). In line with overall SCM philosophy it is important to take a supply chain wide view and to recognise the inevitable trade-offs that need to be addressed, thus raising the following question:

**Q4A: Is the concept of total supply chain cost well understood?**

It was further argued in section 2.8.3 that a trade-off approach to supply chain costing - something which has been a feature of the literature for many years (see, e.g. Beckett 1967; Schiff 1972) - is central to the setting of SCM financial objectives. Ascertaining the extent to which this occurs in practice is captured in the following question:

**Q4B: To what extent is supply chain cost trade-off analysis used?**

A number of supply chain costing methodologies were introduced in section 2.8.3. These included direct product profitability (DPP), activity-based costing (ABC) and total cost of ownership (TCO), as well as the supply chain costing model proposed by La Londe and Pohlen (1996). However, there is a dearth of empirical evidence about the extent to which methodologies such as these are used in practice, thus raising the question:

**Q4C: To what extent are supply chain costing methodologies used?**

As noted in section 2.8.3 investment in supply chain capability aims to improve service performance and/or reduce costs. As noted by New (1996) the expenditure involved can be significant and needs to be subject to the usual investment appraisal processes to assess its value to the firm. There is a significant body of empirical evidence about investment appraisal and capital budgeting approaches used in firms, particularly in the appraisal of investments in technology (see, for example: Small and Chen, 1996; Chan

et al, 2001). However, there is no data in relation to investment in supply chain capability, thus raising the question:

**Q4D: How are supply chain investment opportunities appraised?**

It was suggested in section 2.8.3 that the objective is not just about *reducing costs* as the title of Christopher (1992) suggests. Rather the objective needs to be *to optimise total supply chain investment and cost*. For example, it may be necessary to commit investment to supply chain improvement and/or to increase operating costs to meet (or exceed) customer service requirements. The following question is analogous to Q3F in relation to customer service (see above):

**Q4E: Is there a difference between “reducing costs” and “optimising total supply chain cost and investment”?**

The Service/Cost Conundrum

It was noted earlier that at a conceptual level service and cost objectives may be seen as being somewhat mutually exclusive. The following group of questions relate to this apparent conundrum.

Stevens (1989) noted that the overall objective is to effect a balance between what are often seen as conflicting goals of high customer service and low unit cost. The two simple equations cited in Christopher and Towill (2000), and outlined in section 2.8.4, provide a useful illustration of this issue and leads to the question:

**Q5A: Are cost/investment and service optimisation perceived to be mutually exclusive?**

It was further argued in section 2.8.4 that value-based approaches, and time-based approaches specifically, have the potential to support the simultaneous achievement of cost/invest and customer service objectives. This leads to the following three related questions being formulated:

**Q5B: Is the concept of *value* understood?**

**Q5C: To what extent are *value-based approaches* used to support the simultaneous achievement of cost/investment and customer service objectives?**

**Q5D: To what extent are *time-based approaches* used to support the simultaneous achievement of cost/investment and customer service objectives?**

### **3. *Fundamental Two***

This section describes and justifies the detailed questions developed in relation to *Fundamental Two* (SCM philosophy).

#### **Background**

Before exploring internal and external integration in detail, there are a number of general issues related to the supply chain integration (SCI) concept which are captured in the following questions.

As discussed in detail in section 2.9.1 SCI is at the heart of SCM theory. Perhaps most tellingly, Pagell (2004) declares that “in its essence the entire concept of SCM is really predicated on integration” (p. 460). The extent to which this approach is adopted in practice is unclear, thus raising the question:

#### **Q6A: Does integration play a central role in SCM?**

Several authors make reference to different types and levels of integration. For example: the work of Fawcett and Magnan (2002) identified four levels of integration in practice; Harland et al. (1999) classified research into four areas according to the level of integration between supply chain activities. Similarly, Mentzer et al (2001) - in a theme built upon by Kotzab et al. (2006) - distinguished between SCO and SCM. This approach suggests that the concept of SCI can be interpreted and implemented in different ways. This raises the question:

#### **Q6B: What is the meaning of ‘integration’ in an SCM context?**

#### **Internal Integration**

There are a couple of questions which relate specifically to internal (i.e. intra-firm) integration.

In the context of marketing/logistics interfaces specifically, the work Ellinger (2000), as cited in section 2.9.2, recognises that despite its well documented advantages the extent of internal integration is limited. The work of Sweeney et al. (2007) also suggests that the perceived level of integration of SCM activities is relatively low. This leads to the next question:

### **Q7A: To what extent are internal supply chain activities integrated?**

As further noted in section 2.9.2, there are some key organisational issues associated with internal integration. For example: Monczka et al. (1998) stated that, “SCM requires traditionally separate materials functions to report to an executive responsible for coordinating the entire materials process”; Houlihan (1988) noted that, in an SCM environment, “responsibility for the various segments of the supply chain is not fragmented and relegated to functional areas such as manufacturing, purchasing, distribution and sales”. In this context, Kim (2007) identifies different specific types of organisational structures deployed in the logistics/supply chain arena. These points lead directly to a fundamental organizational question:

### **Q7B: Who has overall responsibility for internal SCM/SCI?**

#### External Integration

As with internal integration, there are a couple of questions related to external (i.e. inter-firm) integration. While ‘complete backward and forward integration’ - as postulated by Fawcett and Magnan (2002) - might be viewed as the theoretical ideal, there is some evidence to suggest that in reality various degrees of integration between upstream and downstream organizations exist (see, for example: Frohlich and Westbrook, 2001; Bask and Juga, 2001; Fabbe-Costes and Jahre, 2007; Fabbe-Costes and Jahre, 2008). The formulated questions relate to upstream and downstream integration respectively:

### **Q8A: What is the level of integration with customers?**

### **Q8B: What is the level of integration with suppliers?**

#### Performance Measurement

It was argued in section 2.9.4 that lack of integration is often a result of functions and activities being measured in isolation from each other. However, the literature suggests that there may be weaknesses in the practical implementation of robust and integrated systems of supply chain KPIs. For example: Beamon (1999) suggested an excessive emphasis on purely financial metrics; Gunasekaran and Tirtiroglu (2001) noted the lack of a “balanced approach” and the lack of a “clear distinction between metrics at strategic, tactical and operational levels” (p.72); Lambert and Pohlen (2001) suggested that in many cases, so-called ‘supply chain metrics’ were often internally focused logistics measures, with a lack of focus on overall supply chain performance. The following questions are concerned with supply chain performance measurement:

**Q9A: What supply chain KPIs are used?**

**Q9B: How are these KPIs used?**

#### **4. *Fundamental Three***

This section describes and justifies the detailed questions developed in relation to *Fundamental Three* (supply chain flow management).

##### Background

It was argued in section 2.10.1 that for a supply chain to achieve its maximum level of effectiveness and efficiency, material flows, money flows and information flows throughout the entire chain must be managed in an integrated and holistic manner, driven by the overall service and financial objectives. However, Forrester (1958) alluded to five flows (manpower and capital equipment being the additional two), with Croom et al. (2000) also referring to five flows (knowledge and technology being the additional two). Some authors focus on a smaller number of flows – for example, Christopher and Ryals (1999) emphasise the importance of managing product (i.e. material) and related information flows. Therefore, before exploring material, money and information flows in detail, the following question relates to identifying the key flows in the supply chain:

**Q10A: What are the key supply chain flows?**

##### Material/Money Flows

It was argued in section 2.10.1 that supply chain operations planning and control is, to a large extent, concerned with the way in which material, money and information flows are managed across the supply chain. The following questions are concerned with the efficiency and effectiveness of material and money flow management in the supply chain:

**Q11A: Are supply chain material flows efficiently and effectively managed?**

**Q11B: Are supply chain money flows efficiently and effectively managed?**

##### Information Flows

The first question below in this section is analogous to Q11A and Q11B above but relates specifically to the efficiency and effectiveness of information flow management in the supply chain.

**Q12A: Are supply chain information flows efficiently and effectively managed?**

As noted in section 2.10.4, recent years have seen rapid developments in the ICT used to facilitate the efficient and effective management of information in the context of SCM, thus raising the question:

**Q12B: What ICT tools are used to support the management of supply chain information flows?**

**5. *Fundamental Four***

As pointed out in section 2.11.1, the need to replace fragmentation with integration (as advocated in *Fundamental Two*) and the holistic approach to flow management (as advocated in *Fundamental Three*) often requires a re-appraisal of the way in which both internal and external customer/supplier relationships are created and managed. The following questions build directly on the questions asked earlier (in particular, Q7A, Q7B, Q8A and Q8B) and deal specifically with internal (i.e. intra-company) and external (i.e. inter-company) relationships:

**Q13A: What is the level and nature of internal supply chain collaboration?**

**Q13B: What is the level and nature of external upstream (i.e. customer-side) collaboration?**

**Q13C: What is the level and nature of external downstream (i.e. supplier-side) collaboration?**

It was noted in section 2.11.5 that supply chain relationships are in essence about people, and that education and learning play a potentially pivotal role in this context. This raises a further question:

**Q13D: What is the role of people/learning in the context of supply chain relationships?**

**6. *Implications***

Finally, there are a number of detailed questions which have been formulated, based specifically on decomposing RQ4 (‘What practical measures could be implemented at policy/supply chain/firm level to improve the level of effective SCM adoption?’) into its three constituent elements. The work of Huber and Sweeney (2007) alluded to the need for appropriate interventions to support the more widespread and appropriate adoption of SCM practices.

**Q14A: What practical measures could be implemented at policy level to improve the level of effective SCM adoption?**

**Q14B: What practical measures could be implemented at supply chain level to improve the level of effective SCM adoption?**

**Q14C: What practical measures could be implemented at firm level to improve the level of effective SCM adoption?**

## APPENDIX 11: FINAL QUESTIONNAIRE

SCM Understanding and Adoption
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### Section 1 - Background

This questionnaire comprises 30 questions and takes less than 10 minutes to complete. As noted in the cover letter, all responses will be treated in the strictest confidence. We would appreciate it, therefore, if the answers that you provide are as honest and objective a reflection of your opinions - and of your organisation's practice - as possible. The more accurately your responses reflect reality, the more valuable they are to our research efforts. Please be as succinct as possible in your answers to the small number of open-ended questions. Thanks again for your time.

1. What is meant by the term "supply chain"?

2. What is meant by the term "supply chain management (SCM)"?

3. What is meant by the term "logistics"?

4. Which of the following statements best describes the relationship between SCM and logistics?

- ☐ SCM is part of logistics ☐ Logistics is part of SCM  
☐ SCM is a new term for logistics ☐ Other

You indicated 'other' in your answer to question 4. Please expand.

5. Indicate the extent to which you agree/disagree with the following statement:

The language and terminology used to define SCM contributes to confusion in understanding

- ☐ Agree strongly  
☐ Agree  
☐ Neither agree nor disagree  
☐ Disagree  
☐ Disagree strongly

6. Many experts have proposed definitions of SCM that use a single sentence. Are such definitions of value?

- ☐ Yes ☐ No ☐ No opinion/don't know



## Section 2- SCM Objectives

7. Does your company formulate specific SCM objectives?

- ☐ Yes ☐ No ☐ Sometimes ☐ Don't know

If specific SCM objectives are formulated do these objectives relate to (tick all relevant boxes):

- ☐ Customer service ☐ Supply chain costs  
☐ Supply chain investment ☐ Environmental sustainability  
☐ Other

You indicated 'other' in your answer to the previous question. Please expand.

8. How important is customer service in the markets that your company serves relative to price and quality? Rank customer service, price and product quality in order of importance (1 = most important; 3 = least important)

\_\_\_ Customer service \_\_\_ Price \_\_\_ Product quality

9. Does your company use customer service audits to understand customer expectations and the performance of competitors?

- ☐ Yes ☐ No ☐ Don't know

10. Which of the following elements of customer service does your company measure? Tick all that are measured.

- ☐ Product availability ☐ Length of order cycle time  
☐ Consistency of order cycle time ☐ On-time delivery  
☐ Documentation accuracy ☐ Information request responsiveness  
☐ Other

You indicated 'other' in your answer to question 10 - please expand.

11. Indicate the extent to which you agree/disagree with the following statement:  
Understanding customer service sets the specification for SCM/supply chain design

- ☐ Agree strongly  
☐ Agree  
☐ Neither agree nor disagree  
☐ Disagree  
☐ Disagree strongly

12. Does your company measure 'total supply chain cost'?

- ☐ Yes ☐ No ☐ Don't know/no opinion

You indicated in question 12 that your company measures 'total supply chain cost'. Please indicate briefly how this is calculated.

13. In supply chain costing, do you use any of the following (please tick all that are used):

- ☐ Cost trade-off analysis ☐ Direct product profitability (DPP)  
☐ Activity-based costing (ABC) ☐ Other

You indicated 'other' in your answer to question 13 - please expand.

14. Indicate the extent to which you agree/disagree with the following statement:  
Cost/investment optimisation and customer service optimisation are mutually exclusive

- ☐ Agree strongly  
☐ Agree  
☐ Neither agree nor disagree  
☐ Disagree  
☐ Disagree strongly

### Section 3- Supply Chain Integration

15. Indicate the extent to which you agree/disagree with the following statement:  
SCM is fundamentally concerned with integration of supply chain activities

- ☐ Agree strongly
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Disagree strongly

16. Please rank the following types of supply chain integration in order of importance (1 = most important; 4 = least important).

- Internal cross-functional integration
- Backward integration with valued first-tier suppliers
- Forward integration with valued first-tier customers
- Complete backward and forward integration ('from the supplier's supplier to the customer's customer')

17. How would you describe the extent to which your company's internal supply chain activities are integrated?

- ☐ Fully integrated
- ☐ Highly integrated
- ☐ Somewhat integrated
- ☐ Poorly integrated
- ☐ Not at all integrated

18. How would you describe the extent to which your company's supply chain activities are integrated with those of your customers?

- ☐ Fully integrated
- ☐ Highly integrated
- ☐ Somewhat integrated
- ☐ Poorly integrated
- ☐ Not at all integrated

19. How would you describe the extent to which your company's supply chain activities are integrated with those of your suppliers?

- ☐ Fully integrated
- ☐ Highly integrated
- ☐ Somewhat integrated
- ☐ Poorly integrated
- ☐ Not at all integrated

20. What supply chain key performance indicators (KPIs) does your company use?

---

## Section 4 - Supply Chain Flow Management

21. How would you describe the the manner in which your company's supply chain material flows are managed?

- ☐ Very well managed
- ☐ Well managed
- ☐ Adequately managed
- ☐ Poorly managed
- ☐ Very poorly managed

22. How would you describe the manner in which your company's supply chain financial flows are managed?

- ☐ Very well managed
- ☐ Well managed
- ☐ Adequately managed
- ☐ Poorly managed
- ☐ Very poorly managed

23. How would you describe the the manner in which your company's supply chain information flows are managed?

- ☐ Very well managed
- ☐ Well managed
- ☐ Adequately managed
- ☐ Poorly managed
- ☐ Very poorly managed

24. Which of the following ICT tools does your company use? Tick all that are used.

- |   |   |
|---|---|
| <input type="checkbox"/> Warehouse management systems   | <input type="checkbox"/> Transport management systems |
| <input type="checkbox"/> Manufacturing planning systems | <input type="checkbox"/> MRP                          |
| <input type="checkbox"/> Enterprise solutions (ERP)     | <input type="checkbox"/> Extended enterprise systems  |
| <input type="checkbox"/> Other                          |   |

You indicated 'other' in your answer to the previous question - please list the ICT tools used.

---

## Section 5 - Supply Chain Relationships

25. How would you describe the nature and extent of relationships between internal supply chain functions?

- ☐ Very strong  
☐ Strong  
☐ Neither strong nor weak  
☐ Weak  
☐ Very Weak

26. How would you describe the nature and extent of relationships with upstream (i.e. customer) companies?

- ☐ Very strong  
☐ Strong  
☐ Neither strong nor weak  
☐ Weak  
☐ Very Weak

27. How would you describe the nature and extent of relationships with downstream (i.e. supplier) companies?

- ☐ Very strong  
☐ Strong  
☐ Neither strong nor weak  
☐ Weak  
☐ Very Weak

## Section 6 - Supply Chain Improvement

28. Has your company implemented any major supply chain improvement initiatives in the last two years?

- ☐ Yes ☐ No ☐ Don't know

If so please indicate briefly the nature of this initiative(s).

29. Does your company plan to implement any major supply chain improvement initiatives in the next two years?

- ☐ Yes ☐ No ☐ Don't know

If so please indicate briefly the nature of this initiative(s).

30. Please let us know if there are any policy initiatives that could be adopted to facilitate wider adoption of SCM.

Please add any comments that you would like to make.

## Respondent Information

Company name (optional):

In which sector does your company primarily operate?

- |   |   |   |   |
|---|---|---|---|
| <input type="radio"/> Manufacture of food products, beverages and tobacco                                 | <input type="radio"/> Manufacture of other non-metallic mineral products                    | <input type="radio"/> Repair and installation of machinery and equipment                  | <input type="radio"/> Information and communication |
| <input type="radio"/> Manufacture of textiles and wearing apparel   | <input type="radio"/> Manufacture of basic metals and fabricated metal products             | <input type="radio"/> Water supply, sewerage, waste management and remediation activities | <input type="radio"/> Health care                   |
| <input type="radio"/> Manufacture of wood and of products of wood and cork, except furniture              | <input type="radio"/> Manufacture of computer, electronic, optical and electrical equipment | <input type="radio"/> Wholesale trade   | <input type="radio"/> Other                         |
| <input type="radio"/> Manufacture of paper and paper products printing and reproduction of recorded media | <input type="radio"/> Manufacture of machinery and equipment not elsewhere classified       | <input type="radio"/> Motor trades  |   |
| <input type="radio"/> Manufacture of chemicals and pharmaceuticals  | <input type="radio"/> Manufacture of transport equipment                                    | <input type="radio"/> Retail trade  |   |
| <input type="radio"/> Manufacture of rubber and plastic products  | <input type="radio"/> Furniture and other manufacturing                                     | <input type="radio"/> Transportation and storage  |   |

What is your number of full-time equivalent employees in Ireland?

- ☐ less than 10      ☐ between 10 and 50      ☐ between 50 and 250      ☐ greater than 250

What is your company's annual turnover?

- ☐ €2m or less      ☐ between €2m and €10m      ☐ between €10m and €50m      ☐ €50m or more

What is your company's balance sheet total?

- ☐ €2m or less      ☐ between €10m and €43m      ☐ Don't know  
☐ between €2m and €10m      ☐ €43m or more

What is your company ownership, please tick one:

- ☐ Irish  
☐ Local operation of multinational company  
☐ Other

You indicated 'other' in your answer to the previous question - please explain.

You indicated that your company is part of a larger international entity. Where is the company's HQ?

- ☐ UK  
☐ Other Europe  
☐ USA  
☐ Asia  
☐ Other

Respondent name (optional):

Respondent title (optional):

Which of the following best describes your professional background?

- ☐ End-to-end supply chain management  
☐ Purchasing (including supplier management)  
☐ Production/operations management  
☐ Transport management  
☐ Warehouse management  
☐ Customer service  
☐ Other

You indicated 'other' in your answer to the previous question - please expand.

Thanks for taking the time to complete this questionnaire. If you would like the results to be sent to you then please insert your email address below.

## APPENDIX 12: QUESTIONNAIRE COVER LETTER

Dear

We at NITL would be very grateful if you could take a few minutes to complete the questionnaire which can be found at:

<http://www.sphinxonline.com/comptes/default.aspx>

The National Institute for Transport and Logistics (NITL) is Ireland's national 'centre of excellence' in logistics and supply chain management (SCM). We are involved in research, education, consultancy and awareness creation in the SCM and logistics fields. In all facets of our work, we collaborate closely with companies in all major sectors of the Irish economy, as well as with many Government departments and agencies. We in NITL believe that the application of SCM thinking has the potential to significantly improve competitive advantage thus allowing firms to prosper and the economy as a whole to recover in a sustainable way.

This survey is being undertaken as part of NITL's ongoing research into SCM understanding and adoption in Ireland. It aims to establish the level of understanding of SCM, as well as the extent to which SCM is being adopted, in companies in Ireland. The survey is just one aspect of a wider research project that involves interviews, focus groups and case studies. The results will be used, amongst other things, to inform enterprise policy making in this area over the coming years.

We would be grateful if you could complete the questionnaire by DD/MM/2010. It takes just a few minutes to complete and we would be very grateful if you could take this time to help us with this important work.

We can of course guarantee you that all responses will be treated in strict confidence and we will be happy to provide you with a copy of the results once they become available. To acknowledge your support with this survey we will issue a free ticket to the next *Logistics Ireland* conference – Ireland's premier SCM event - to 10% of respondents chosen at random.

Thanks for your time and please do not hesitate to contact myself or any of my colleagues if we can be of any assistance.

Regards,

Edward Sweeney  
Director of Learning, NITL

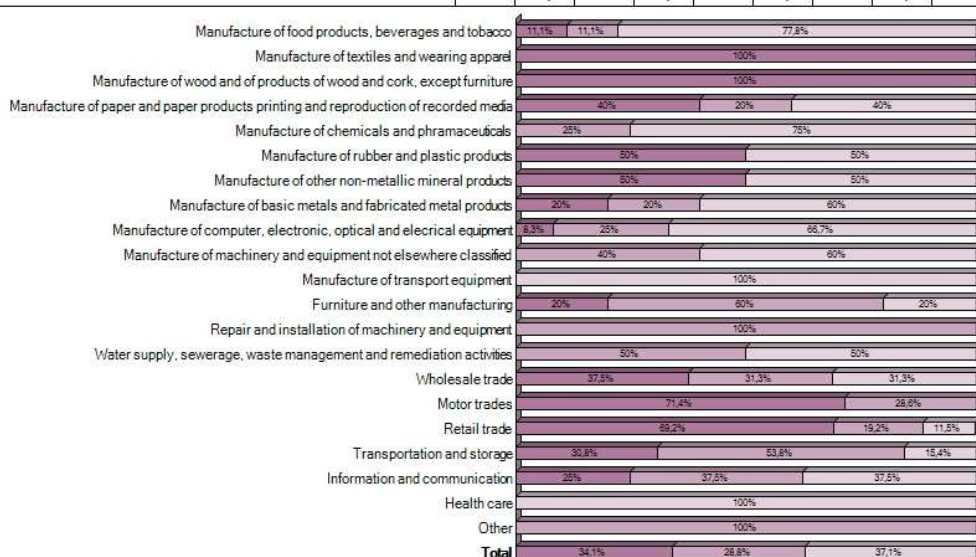
## APPENDIX 13: ANALYSIS OF RESPONDENT DEMOGRAPHIC DATA

This Appendix provides a detailed analysis of the linkages between various demographic data collected in the quantitative survey. It focuses mainly on the demographic factors used in the data analysis in section 6.11 – sector, firm size, firm ownership and respondent background.

Figure 1 shows the link between sector and firm size as measured by number of employees. The  $X^2$  test suggests that dependence is highly significant.

What is your number of full-time equivalent employees in Ireland?  
In which sector does your company primarily operate?

	less than 10		between 10 and 50		between 50 and 250		greater than 250		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Manufacture of food products, beverages and tobacco	0	0,0%	1	11,1%	1	11,1%	7	77,8%	9	100,0%
Manufacture of textiles and wearing apparel	0	0,0%	1	100,0%	0	0,0%	0	0,0%	1	100,0%
Manufacture of wood and of products of wood and cork, except furniture	0	0,0%	1	100,0%	0	0,0%	0	0,0%	1	100,0%
Manufacture of paper and paper products printing and reproduction of recorded media	0	0,0%	2	40,0%	1	20,0%	2	40,0%	5	100,0%
Manufacture of chemicals and pharmaceuticals	0	0,0%	0	0,0%	2	25,0%	6	75,0%	8	100,0%
Manufacture of rubber and plastic products	0	0,0%	1	50,0%	0	0,0%	1	50,0%	2	100,0%
Manufacture of other non-metallic mineral products	0	0,0%	1	50,0%	0	0,0%	1	50,0%	2	100,0%
Manufacture of basic metals and fabricated metal products	0	0,0%	1	20,0%	1	20,0%	3	60,0%	5	100,0%
Manufacture of computer, electronic, optical and electrical equipment	0	0,0%	1	8,3%	3	25,0%	8	66,7%	12	100,0%
Manufacture of machinery and equipment not elsewhere classified	0	0,0%	0	0,0%	2	40,0%	3	60,0%	5	100,0%
Manufacture of transport equipment	0	0,0%	0	0,0%	0	0,0%	1	100,0%	1	100,0%
Furniture and other manufacturing	0	0,0%	1	20,0%	3	60,0%	1	20,0%	5	100,0%
Repair and installation of machinery and equipment	0	0,0%	0	0,0%	1	100,0%	0	0,0%	1	100,0%
Water supply, sewerage, waste management and remediation activities	0	0,0%	0	0,0%	1	50,0%	1	50,0%	2	100,0%
Wholesale trade	0	0,0%	6	37,5%	5	31,3%	5	31,3%	16	100,0%
Motor trades	0	0,0%	5	71,4%	2	28,6%	0	0,0%	7	100,0%
Retail trade	0	0,0%	18	69,2%	5	19,2%	3	11,5%	26	100,0%
Transportation and storage	0	0,0%	4	30,8%	7	53,8%	2	15,4%	13	100,0%
Information and communication	0	0,0%	2	25,0%	3	37,5%	3	37,5%	8	100,0%
Health care	0	0,0%	0	0,0%	0	0,0%	2	100,0%	2	100,0%
Other	0	0,0%	0	0,0%	1	100,0%	0	0,0%	1	100,0%
<b>Total</b>	<b>0</b>	<b>0,0%</b>	<b>45</b>	<b>34,1%</b>	<b>38</b>	<b>28,8%</b>	<b>49</b>	<b>37,1%</b>	<b>132</b>	



$p = 0.6\%$  ;  $\chi^2 = 65.86$  ;  $\text{dof} = 40$  (VS)

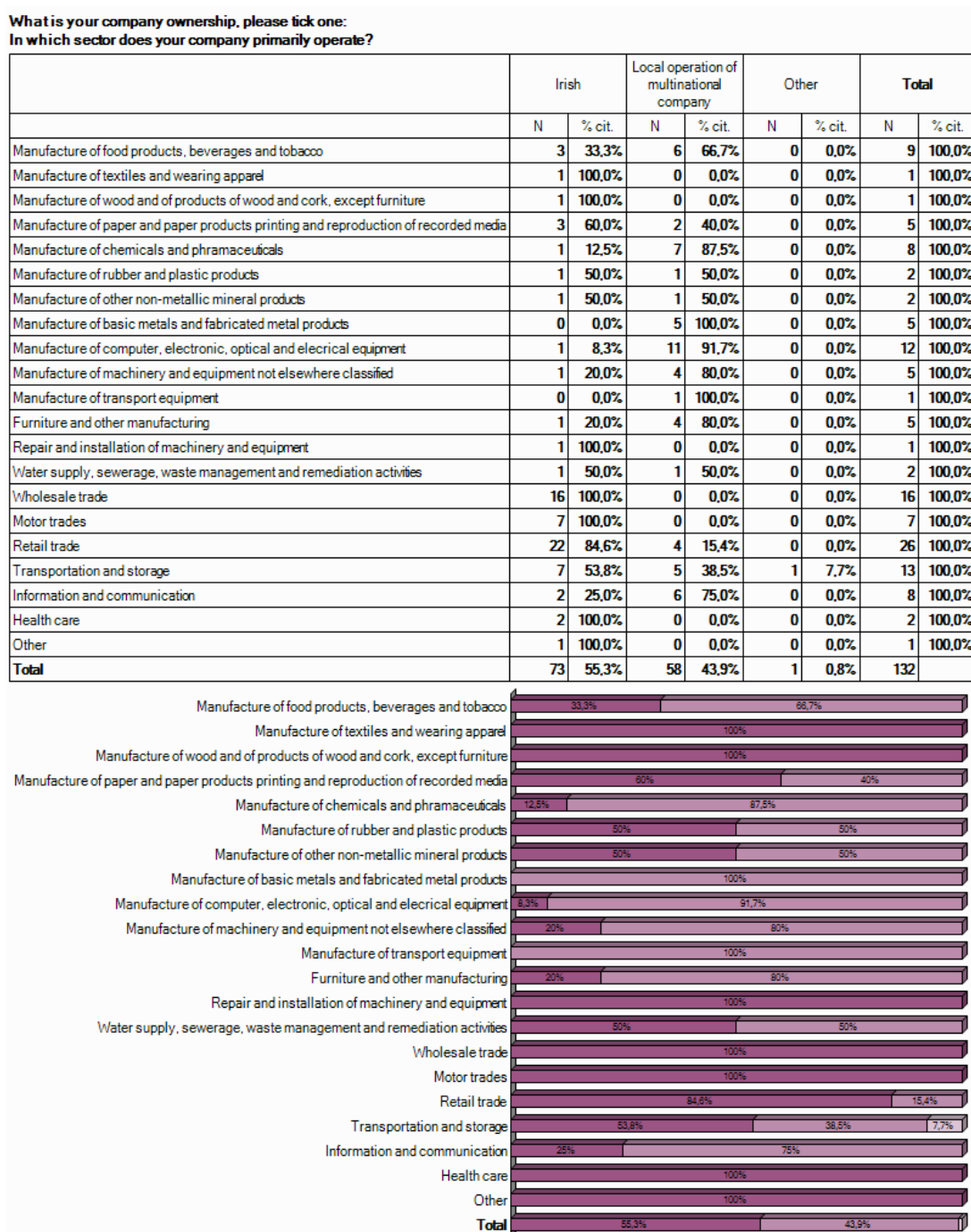
Dependence is highly significant.

Figure 1: Sector and Firm Size



The highly significant dependence is mainly due to the large number of small firms in the retail trade (and the proportionately small number of large firms in this sector). The other significant factor is the relatively large number of large firms in the food products, beverages and tobacco sector.

Figure 2 shows the link between sector and firm ownership with the  $X^2$  test again suggesting that dependence is highly significant.



$p = <0.01\%$  ;  $\chi^2 = 76.31$  ;  $\text{dof} = 40$  (VS)

Dependence is highly significant.

Figure 2: Sector and Firm Ownership



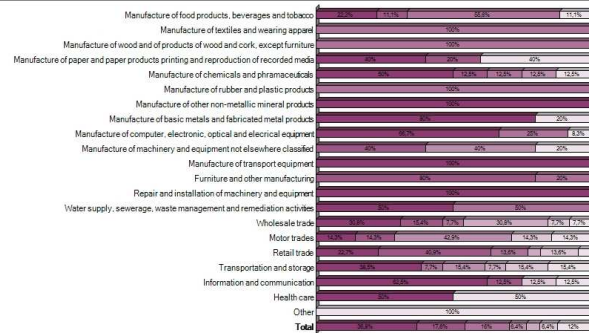
The highly significant dependence is mainly due to the large number of multinational firms in the computer, electronic, optical and electrical sector (and the proportionately small number of Irish firms in this sector). Similar, albeit less significant, situations pertain in the chemical and pharmaceutical and information and communications sectors. The other significant factor is the relatively large number of Irish firms in the wholesale and retail trade.

Figure 3 shows the link between sector and respondent background with the  $X^2$  test again suggesting that dependence is highly significant. A more detailed analysis of this suggests that relatively large numbers of respondent backgrounds are prevalent in particular sectors with the most significant as follows:

- Purchasing (including supplier management) in furniture and other manufacturing and in the retail trade;
- Production/operations management in traditional sectors such as food products, beverages and tobacco, textiles and wearing apparel, rubber and plastic products;
- Transport management in machinery and equipment not elsewhere classified and the motor trade;
- Warehouse management in the wholesale trade; and,
- End-to-end SCM in technology-oriented sectors such as chemicals and pharmaceuticals, computer, electronic, optical and electrical and information and communications.

Which of the following best describes your professional background?  
In which sector does your company primarily operate?

	End-to-end supply chain management			Purchasing (including supplier management)			Production/operations management			Transport management			Warehouse management			Customer service			Other			Total		
	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.	N	% cit.	Theor.
Manufacture of food products, beverages and tobacco	2	22.2%		1	11.1%		5	55.6%	+(VS)	0	0.0%		0	0.0%		0	0.0%		1	11.1%		9	100.0%	
Manufacture of textiles and wearing apparel	0	0.0%		0	0.0%		1	100.0%	+(S)	0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	100.0%	
Manufacture of wood and of products of wood and cork, except furniture	0	0.0%		0	0.0%		1	100.0%	+(S)	0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	100.0%	
Manufacture of paper and paper products printing and reproduction of recorded media	2	40.0%		1	20.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		2	40.0%	+(LS)	5	100.0%	
Manufacture of chemicals and pharmaceuticals	4	50.0%		1	12.5%		1	12.5%		1	12.5%		0	0.0%		0	0.0%		1	12.5%		8	100.0%	
Manufacture of rubber and plastic products	0	0.0%		0	0.0%		2	100.0%	+(VS)	0	0.0%		0	0.0%		0	0.0%		0	0.0%		2	100.0%	
Manufacture of other non-metallic mineral products	2	100.0%	+(LS)	0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		2	100.0%	
Manufacture of basic metals and fabricated metal products	4	80.0%	+(LS)	0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	20.0%		5	100.0%	
Manufacture of computer, electronic, optical and electrical equipment	8	66.7%	+(LS)	0	0.0%	-(LS)	3	25.0%		0	0.0%		0	0.0%		0	0.0%		1	8.3%		12	100.0%	
Manufacture of machinery and equipment not elsewhere classified	0	0.0%		2	40.0%		0	0.0%		2	40.0%	+(VS)	0	0.0%		0	0.0%		1	20.0%		5	100.0%	
Manufacture of transport equipment	1	100.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	100.0%	
Furniture and other manufacturing	0	0.0%		4	80.0%	+(VS)	1	20.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		5	100.0%	
Repair and installation of machinery and equipment	1	100.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	100.0%	
Water supply, sewerage, waste management and remediation activities	1	50.0%		0	0.0%		1	50.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		2	100.0%	
Wholesale trade	4	30.8%		2	15.4%		1	7.7%		0	0.0%		4	30.8%	+(VS)	1	7.7%		1	7.7%		13	100.0%	
Motor trades	1	14.3%		1	14.3%		0	0.0%		3	42.9%	+(VS)	0	0.0%		1	14.3%		1	14.3%		7	100.0%	
Retail trade	5	22.7%		9	40.9%	+(VS)	3	13.6%		0	0.0%		1	4.5%		3	13.6%		1	4.5%		22	100.0%	
Transportation and storage	5	38.5%		0	0.0%	-(LS)	1	7.7%		2	15.4%		2	15.4%		2	15.4%		2	15.4%		13	100.0%	
Information and communication	5	62.5%		1	12.5%		0	0.0%		0	0.0%		0	0.0%		1	12.5%		1	12.5%		8	100.0%	
Health care	1	50.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	50.0%	+(LS)	2	100.0%	
Other	0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		0	0.0%		1	100.0%	+(S)	1	100.0%	
Total	46	36.8%		22	17.6%		20	16.0%		8	6.4%		6	4.8%		8	6.4%		15	12.0%		125		



$p = 0.7\%$  ;  $\chi^2 = 161.35$  ;  $dof = 120$  (VS)

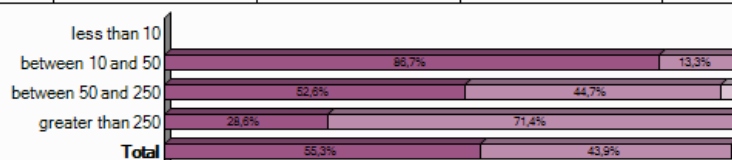
Dependence is highly significant.

Figure 3: Sector and Respondent Background

Figure 4 shows the relationship between firm size as measured by number of employees and firm ownership. As is clearly shown in the factor map in Figure 5, the majority of small firms are indigenous while the majority of large firms are local operations of multinationals.

What is your company ownership, please tick one:  
What is your number of full-time equivalent employees in Ireland?

	Irish	Local operation of multinational company	Other	Total
less than 10	0	0	0	0
between 10 and 50	39	6	0	45
between 50 and 250	20	17	1	38
greater than 250	14	35	0	49
<b>Total</b>	<b>73</b>	<b>58</b>	<b>1</b>	<b>132</b>



$p = <0.1\%$  ;  $\chi^2 = 34.88$  ;  $dof = 4$  (VS)

Dependence is highly significant.

Figure 4: Firm Size and Ownership

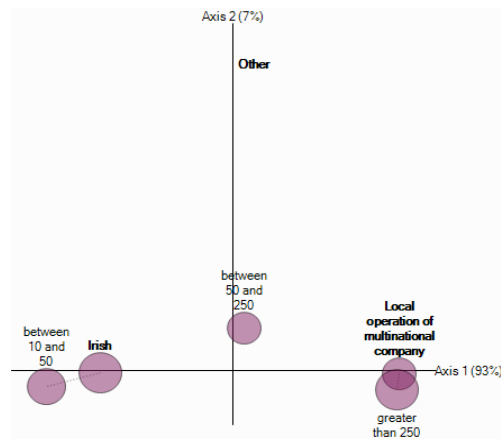
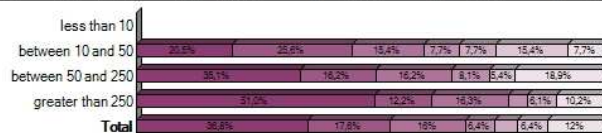


Figure 5: Factor Map - Firm Size and Ownership

Figures 6 and 7 show the relationship between, on the one hand, firm size and firm ownership, and, on the other hand, respondent background. The  $\chi^2$  tests reveal dependences that are significant (S) but more detailed analysis – including factor map – does not reveal anything of particular interest.

Which of the following best describes your professional background?  
What is your number of full-time equivalent employees in Ireland?

	End-to-end supply chain management		Purchasing (including supplier management)		Production/ operations management		Transport management		Warehouse management		Customer service		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
less than 10	0		0		0		0		0		0		0		0	100,0%
between 10 and 50	8	20,5%	10	25,6%	6	15,4%	3	7,7%	3	7,7%	6	15,4%	3	7,7%	39	100,0%
between 50 and 250	13	35,1%	6	16,2%	6	16,2%	3	8,1%	0	0,0%	2	5,4%	7	18,9%	37	100,0%
greater than 250	25	51,0%	6	12,2%	8	16,3%	2	4,1%	3	6,1%	0	0,0%	5	10,2%	49	100,0%
Total	46	36,8%	22	17,6%	20	16,0%	8	6,4%	6	4,8%	8	6,4%	15	12,0%	125	



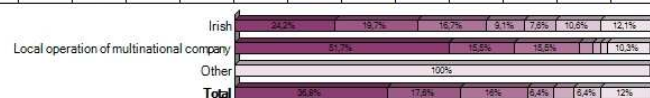
$p = 4.4\%$  ;  $\chi^2 = 21.46$  ; dof = 12 (S)

Dependence is significant.

Figure 6: Firm Size and Respondent Background

Which of the following best describes your professional background?  
What is your company ownership, please tick one:

	End-to-end supply chain management		Purchasing (including supplier management)		Production/ operations management		Transport management		Warehouse management		Customer service		Other		Total	
	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.	N	% cit.
Irish	16	24,2%	13	19,7%	11	16,7%	6	9,1%	5	7,6%	7	10,6%	8	12,1%	66	100,0%
Local operation of multinational company	30	51,7%	9	15,5%	9	15,5%	2	3,4%	1	1,7%	1	1,7%	6	10,3%	58	100,0%
Other	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%	1	100,0%	1	100,0%
Total	46	36,8%	22	17,6%	20	16,0%	8	6,4%	6	4,8%	8	6,4%	15	12,0%	125	



$p = 4.1\%$  ;  $\chi^2 = 21.68$  ; dof = 12 (S)

Dependence is significant.

Figure 7: Firm Ownership and Respondent Background